LEFFEL

ENGINES · BOILERS

· CATALOGUE O ·

THE JAMES LEFFEL & CO.
SPRINGFIELD, OHIO, U.S.A.

Steam Engines and Boilers

Catalogue "O" *Superseding all previous editions*

Manufactured by

The James Leffel & Company · Springfield Ohio · U. S. A.

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LEFFEL STEAM ENGINES AND BOILERS

IN GENERAL

The Engines and Boilers herein illustrated and described are the outgrowth, and embody the best results of our forty-four years continuous experience manufacturing and furnishing power equipment for the many varied industries of this and other lands. This extensive experience, together with our large and commodious shops, fully equipped with the latest improved electrically driven tools, especially adapted for our work, over-head electric and hand traveling cranes, a complete system of industrial railway tracks traversing our shop floors, our splendid railroad location with convenient side-tracks, and our large force of skilled workmen, all combined, afford us economical productive facilities surpassed by none, and enable us to offer inducements in quality and price which the prospective buyer will find to his interest to carefully consider before purchasing elsewhere.

Since issuing our last catalogue we have greatly increased our facilities by the addition of a large new boiler shop fully equipped with the latest improved electrically driven rolls, punches, bevel shears, pneumatic riveters, over-head electric traveling crane, etc., etc., enabling considerably enlarging the scope of our boiler work, and which is evidenced by the larger sizes of Internal-Fired Return Tubular Portable Boilers and Tubular Stationary Boilers, and additional lines of Locomotive Portable Boilers, also Full Length Tube Vertical Boilers included in following pages.

Recognizing the fact most purchasers are aware the general principles of engine and boiler construction are practically the same, and that it is only in details where improvements and increased efficiency can be looked for, we are offering customers information along this line not usually found in trade catalogues, by plainly showing and describing in detail some of the distinguishing features, characteristic of the superior excellence and greater worth of our goods. Attention is also called to the very liberal and positive guarantee herewith.

We would suggest to probable buyers who may be figuring with other parties, it will be to their interest to have equally full information regarding details of, and definite guarantee covering such other makes for proper comparison before buying elsewhere.

The various illustrations and descriptions herein faithfully portray our engines and boilers as now built, and embody what is considered best practice at this time. It is, however, the purpose and policy of this company to keep fully abreast of the times, and have all our work strictly up-to-date in every respect, and should changing conditions suggest desirable improvements, the right is reserved to make such alterations or changes in the construction or attachments as we may deem best.

All engines and boilers built and furnished by this company are sold subject to the following strong, plain and positive guarantee:

LEFFEL GUARANTEE

All material and workmanship throughout our Engines and Boilers are guaranteed strictly first-class, and entirely suited for the service intended, and this definite guarantee is backed up by our positive offer to replace on board car at factory, free of charge, any piece or part proving defective within one year from date of shipment. They are also warranted of sufficient capacity, and built amply strong to well develop their full rated power when properly attached and managed.

The James Leffel & Company

SPRINGFIELD, OHIO, U. S. A.

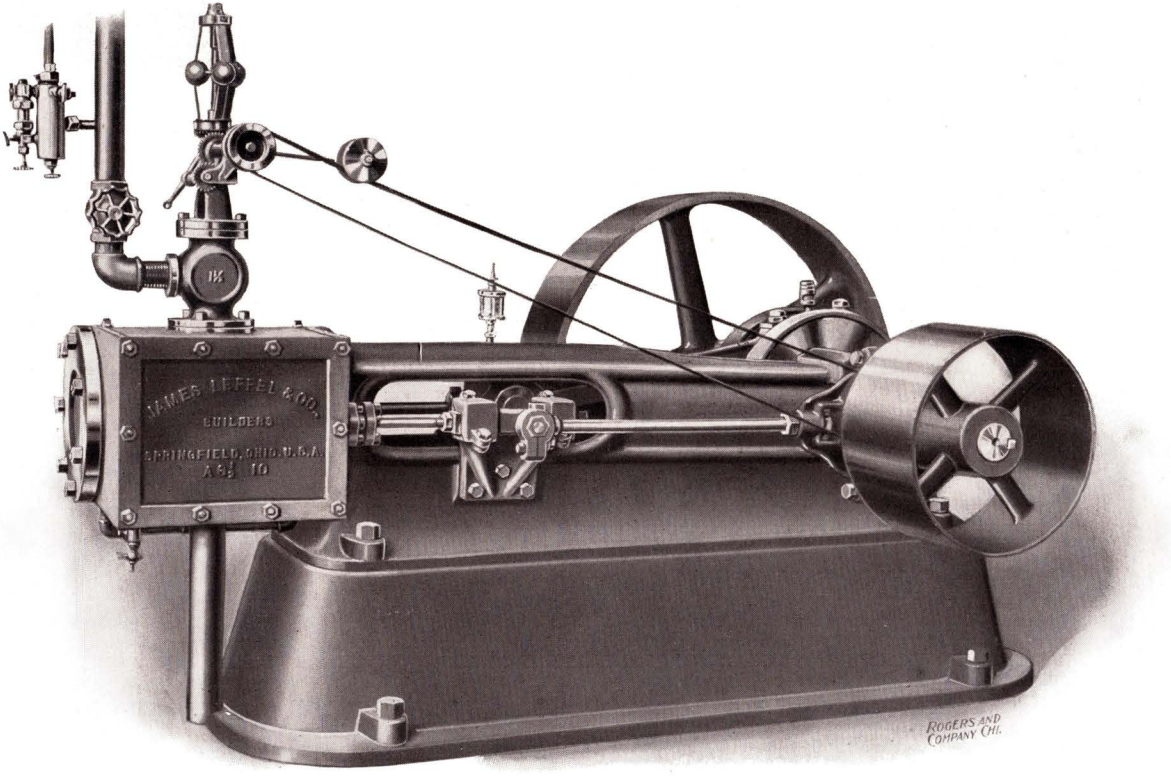


Fig. 1. Leffel Class "A" Engine on Iron Sub-Base. 7″x 10″ size and larger.

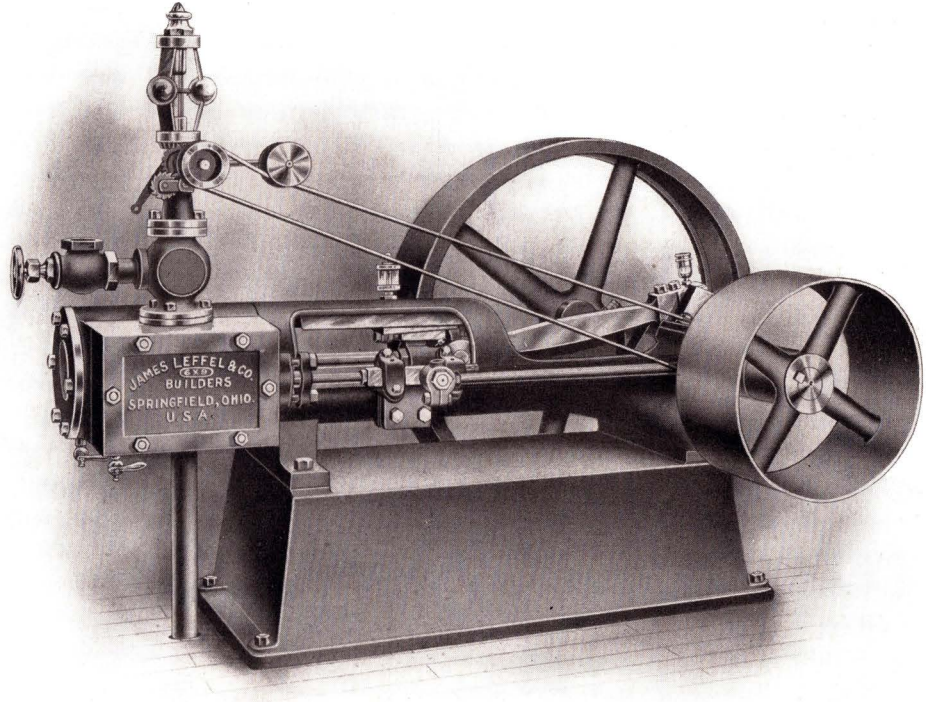


Fig. 2. Leffel 5″x 6″ and 6″x 9″ Class "A" Engine on Iron Sub-Base.

Leffel Class "A" Standard Center Crank Throttling Engines

In Detail

THESE Engines are of the Self-Contained Center-Crank type. Experience has proven a properly designed and well built engine of this type affords a stronger, more symmetrical, and more evenly balanced construction, and one capable of a wider range of duty. The pulleys are interchangeable on engine shaft, enabling using the one engine as a right and left hand engine, and belt can be run either forward or backward from both pulleys, and two machines driven at same time without counter shaft.

Fig. 1, page 4, was made from photograph of 7 x 10 Class "A" Engine on iron sub-base, and shows the general design of this and larger sizes. Fig. 2, page 5, shows 5 x 6 and 6 x 9 Class "A" Engines on iron sub-base. Sub-base can be omitted, and engine bed proper set direct on foundation.

MAIN FRAME AND BED is of substantial proportions, and specially strong, stiff and extra well braced, making it absolutely firm and preventing any possible springing, thus insuring permanent alignment of parts and consequent cool and smooth running.

MAIN SHAFT BEARINGS are well babbitted, easily adjusted for wear, and fitted with oil cups for lubricating.

BALANCED VALVE. All Class "A" Engines of 7 x 10 size and larger are equipped with the high grade type of Balanced Valve illustrated and described on page 17. It greatly lessens friction, making

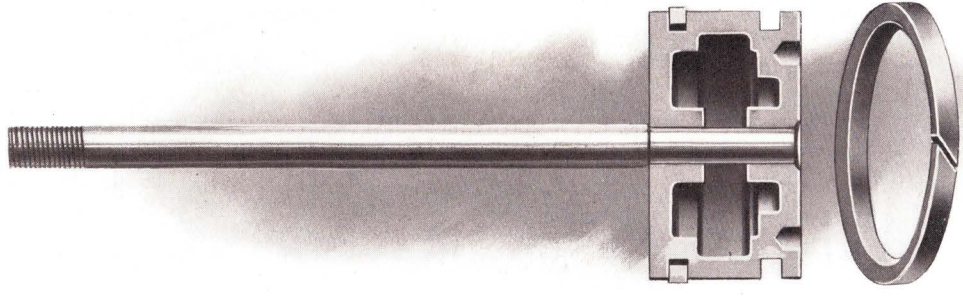


Fig. 3. Leffel Piston, Piston Rod, and Piston Ring.

Leffel Class "A" Standard Center-Crank Throttling Engines—Continued

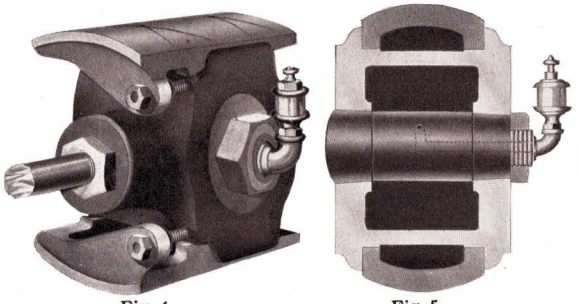


Fig. 4 Fig. 5

Leffel Cross-Head

work of eccentric and valve operating parts much lighter, and enables engine furnishing more actual power to driving belt, and also promotes durability. The 5 x 6 and 6 x 9 sizes are fitted with plain D slide valves.

CYLINDER AND STEAM CHEST, of 7 x 10 and larger sizes, are cast together, and firmly attached to end of bed with studs and nuts. The 5 x 6 and 6 x 9 sizes have cylinder, steam chest and bed cast together. Cylinder is provided with efficient non-conductor covering and neat fitting jacket.

PISTON is provided with Self-Adjusting Metallic Packing Rings, cut eccentric and fitting in grooves in piston, as shown in detail Fig. 3, page 6.

PISTON ROD is of steel and turned to a tight force fit in piston, with suitable shoulder against which piston is forced on rod, and end of latter is then securely riveted over, tightly and firmly holding piston in place, as illustrated, Fig. 3. The other end of Piston Rod is threaded and screwed into cross-head, and fitted with jam nut, as Figs. 3 and 4 show.

CROSS-HEAD is of thoroughly mechanical design and construction, having pin located mid-center, and provided with substantial wedge-shaped shoes having extra large wearing surface, and made conveniently adjustable for taking up wear by means of threaded stud bolts fitting through hole in lug on end of shoe, and equipped with set and lock nuts, as plainly shown in Figs. 4 and 5.

CROSS-HEAD PIN on 7 x 10 and larger sizes is of steel, having ends turned tapering to fit taper bored holes in Cross-head, and one end of pin is threaded and fitted with substantial nut. This construction provides for taking up any wear or looseness of pin at any time. This Cross-head Pin is lubricated by an elbow shank oil cup screwing into hole tapped into end of pin, from which a drilled hole is continued, extending to about mid-length of pin, and into which two branch holes are drilled leading at an angle to top side of pin, so that the oil working down from out these branch holes will pass over wearing surface of pin, as shown in Fig. 5. The 5 x 6 and 6 x 9 Engines are fitted with plain straight pins.

CROSS-HEAD GUIDES are of type known as "bored guides," now used by leading builders of the better grade engines. They have extra large surface, and their concave form enables self-adjustment of Cross-head to connecting rod, preventing any liability of latter being thrown in a twist.

Leffel Class "A" Standard Center-Crank Throttling Engines—Continued

CONNECTING ROD is of size and form possessing surplus strength in excess of requirements, and is provided with extra heavy brass boxes at each end, easily adjustable for taking up wear and keeping distance between centers the same at all times, as illustrated in sectional cuts of rod ends shown in Fig. 6. Cross-head end is of solid end type, while crank-pin end is provided with strap, as Fig. 6 shows. The adjusting wedge blocks at each end of rod are equal in width to thickness of rod and strap, thus affording a generously wide bracing back of brasses, which is in marked contrast and far superior to the thin, narrow key used by some builders.

ECCENTRIC is accurately turned to correct size and securely attached to main shaft, arranged and plainly marked to enable easily reversing motion of engine at any time desired; that is, engine can be readily set to run either "over" or "under," the coinciding lines being marked on shaft "O" for "over" and "U" for "under." Unless otherwise directed, the engines are set in factory to run "over," that is, top of pulley turns from cylinder.

ECCENTRIC STRAP is of substantial construction, accurately bored out to fit eccentric, and is adjustable to wear. It is provided with oil cup for lubrication.

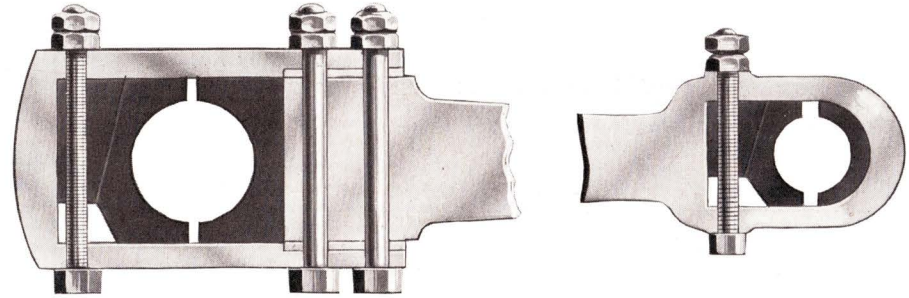


Fig. 6. Leffel Connecting Rod Ends.

Leffel Class "A" Standard Center-Crank Throttling Engines—Continued

ECCENTRIC ROD is fitted with a simple but efficient adjustable head or clamp box connection to steel guide bar pin.

GUIDE BAR BRACKET is extra strong and stiff, and has two split babbitted bearings adjustable for wear, and provided with oil chambers.

ECCENTRIC ROD CONNECTING PIN is of steel, and securely attached to steel guide bar, and operates between the two bearings on bracket, affording most substantial and durable construction.

VALVE ROD is of steel, and screws into hole tapped into end of guide bar, and is fitted with jam nut. The other end is up-set and finished to proper size for fitting into milled jaw opening on valve.

DRIVING PULLEYS are accurately turned up true, carefully balanced, and bored to neatly fit main shaft, and both pulleys and shaft are key-seated and fitted with gib-head key.

GOVERNOR is very sensitive, quick acting and close regulating type. It is provided with a speed adjuster that will enable obtaining 25 to 30 per cent variation in the revolutions of engine, and this change can be made while engine is running, if desired. It also has an Automatic Safety Stop Adjustment that is simple and certain in its action. Should the governor belt break or run off either pulley, this device will promptly act automatically, shutting off steam from engine and stopping same without anyone going near, thus preventing accident and damage that might happen without this attachment. Governor is also provided with Sawyer's Lever Attachment, useful in saw mill or other intermittent speed service, and by means of which engine can be slowed or closed entirely down, or run at full speed.

EXHAUST PIPE is located directly in bottom of cylinder, thus affording most complete drainage of condensed or entrained water. Cylinder is also provided with suitable drain cock at each end in bottom.

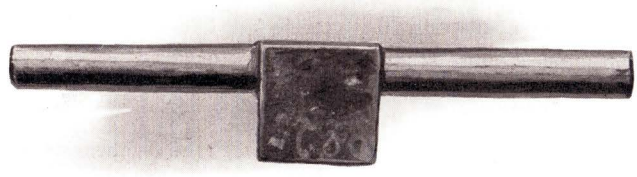


Fig. 7. Rough Forging of Crank Shaft, as delivered from Forge Hammer.

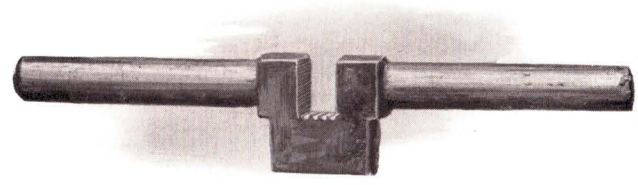


Fig. 8. Rough Forging of Crank Shaft, with Crank Slotted Out, as delivered from Slotting Machine.

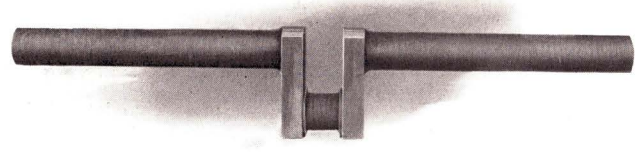


Fig. 9. Rough Turned Crank Shaft, as delivered from Roughing-Out Lathe.

Solid Forged Steel Main Shaft for Leffel Class "A" and "B" Engines

ONE of the most important parts about an engine is the Main Shaft, and too much care cannot be exercised by prospective buyers in examining carefully and knowing definitely the dimensions and construction in details of same. Without a good, strong, stiff and well made main shaft, that will stand up to the work, no matter how good otherwise an engine may be, it is bound to give trouble.

Special attention is therefore directed to the superior design and construction of our Solid Forged Steel Main Shaft, plainly shown in illustrations herewith (Figs. 7, 8, 9 and 10). This entire shaft, including Crank Pin and Arms, is forged in one solid piece from best quality steel, and is without welds or built-up parts. No separate crank pin or separate end pieces here to work loose and give trouble, such as is found in some other engines. The counter-balance discs are firmly and securely attached to shaft, as shown in Fig. 10, then all put in lathe and turned up, insuring a perfectly true and accurate job. This gives a finished shaft that is second to none and is in keeping with the strictly first-class construction of these engines throughout.

The shafts for 5 x 6 and 6 x 9 engines are also solid steel forgings, but not provided with counter-balance discs.

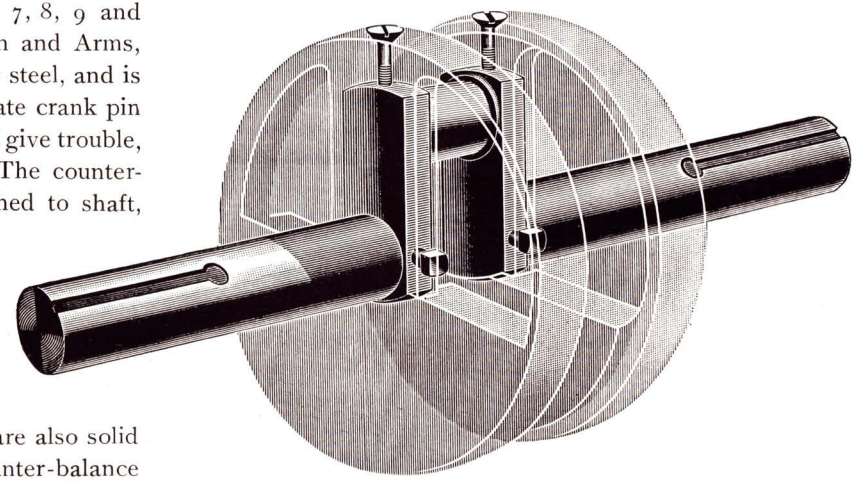


Fig. 10. Finished shaft as delivered from lathe ready to put in engine.

INSPECTION AND TEST. Each engine is run, carefully inspected and tested under full load and steam pressure before leaving factory.

On account of being specially well designed with generously large wearing surfaces, and built in a more substantial and exceptionally strong manner throughout, these engines will easily furnish more power than other makes of about the same dimensions. They are guaranteed of ample capacity, and built abundantly strong to well develop a fair surplus over the power ratings given in this catalogue.

When writing us, please read "Remarks," page 55.

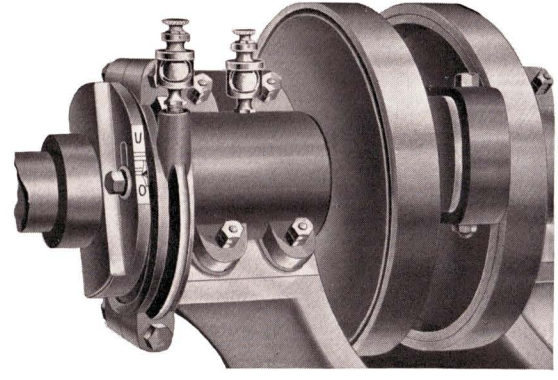


Fig. 11. Variable Cut-Off and Reverse Motion

Variable Cut-Off and Reverse Motion

This attachment can be furnished on 7 x 10 and larger Class "A" Engines only. As Fig. 11 shows, it consists of hub plate keyed to shaft, with valve eccentric bolted thereto, in a manner enabling quickly and easily varying point of cut-off from zero to three-quarter stroke, or reversing motion of engine with same variation in cut-off.

As regularly furnished, any of the Class "A" Engines can be readily reversed, that is, run "over" or "under" at any time, but this Hub Plate Variable Cut-Off Attachment is not supplied except when specially ordered, and at slight additional charge.

Leffel Class "A" Standard Center Crank Throttling Engines

SPECIFICATIONS

Size No. of Engine	Horse Power	Cylinder		Standard Number of Revolutions per Minute	Large Driving Pulley		Small Driving Pulley		Diam. of Steam Pipe Inches	Diam. of Exhaust Pipe Inches	Diam. of Main Shaft Inches	Diam. of Crank Pin Inches	Approximate Floor Space Engine Occupies				Approximate Shipping Weight with Sub-Base Pounds	Approximate Shipping Weight without Sub-Base Pounds
		Diam. Inches	Stroke Inches		Diam. Inches	Face Inches	Diam Inches	Face Inches					Length Ft.	Length In.	Width Ft.	Width In.		
1	6	5	6	240	24	7	12	7	1	1¼	1¾	1⅝	4	1	2	6	700	600
2	8 to 10	6	9	220	36	7	16	8	1¼	1½	2¼	2	5	7	3	0	1125	900
3	12 to 15	7	10	180	40	10½	16	8	1½	2	2⅞	2⅞	6	5	3	8	2300	2000
4	16 to 18	8	10	180	40	10½	16	8	2	2½	2⅞	2⅞	6	5	3	8	2350	2050
5	20 to 23	9	10	175	42	10½	18	8	2	2½	3⅜	3¼	6	9	4	2	2450	2150
6	25 to 28	10	10	175	42	10½	18	8	2½	3	3⅜	3¼	6	9	4	2	2550	2250
7	30 to 34	9½	12	175	48	12½	22	10½	2½	3	3⅞	3¾	7	11	5	0	4450	4000
8	35 to 40	10½	12	175	48	12½	22	10½	2½	3½	3⅞	3¾	7	11	5	0	4550	4100

"Regular Fixtures Complete" include two Driving Pulleys, as per above list, turned, bored, balanced, keyseated and fitted to shaft, Governor with Automatic Safety Stop, Speed Adjuster and Sawyer's Lever, and bolts for bolting Governor in position to Steam Chest, Governor Belt, Throttle Valve with Nipple for attaching to Governor, full set Oil Cups including Automatic Sight-Feed Cylinder Lubricator with connections, Oil Can, Cylinder Drain Cocks attached to Cylinder, and Wrenches.

Foundation Bolts, Steam and Exhaust Pipe, and Cast-Iron Sub-Base are not furnished unless specially ordered and charged for extra.

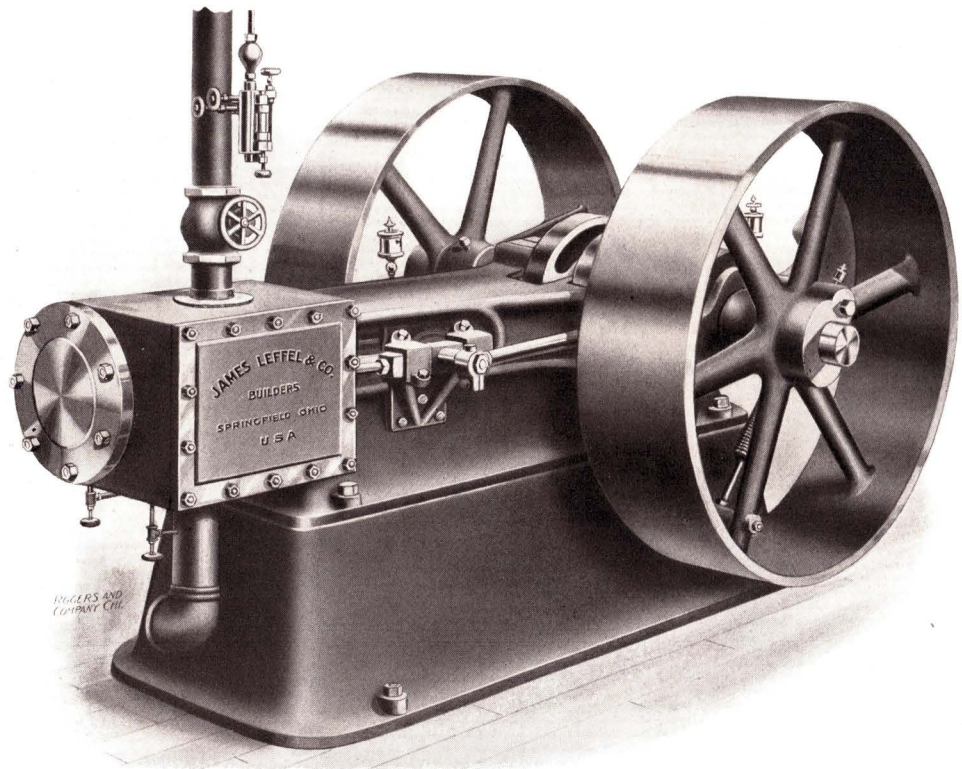


Fig. 12 Leffel Class "B" Engine on Iron Sub-Base. Steam Chest side.

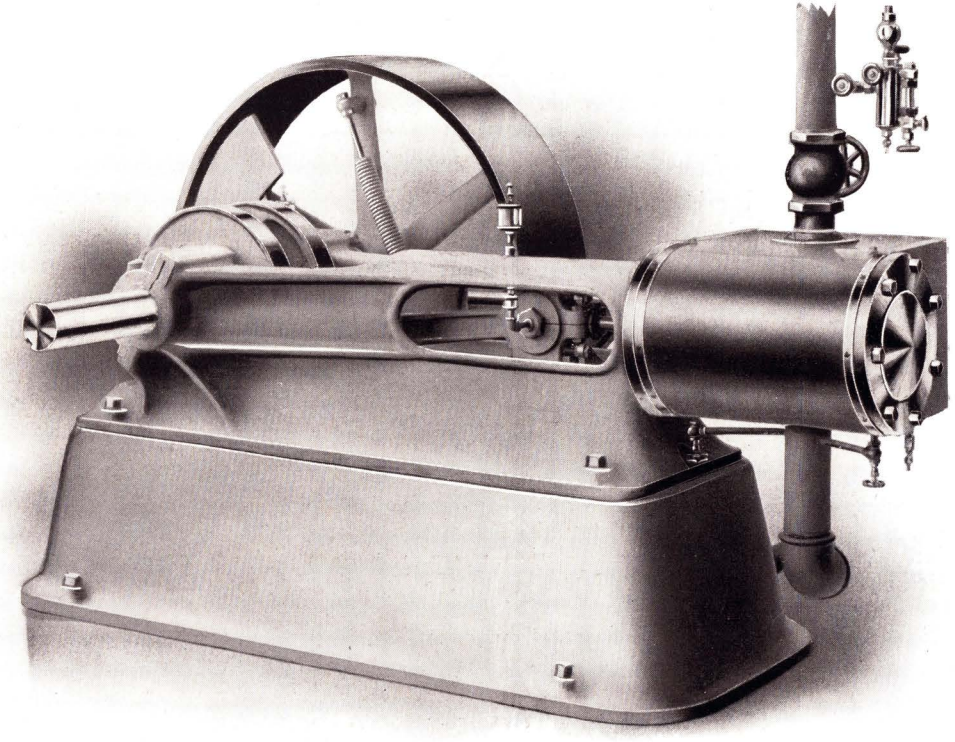


Fig. 13. Leffel Class "B" Engine on Iron Sub-Base. Cylinder side.

Leffel Class "B" Standard Center-Crank Automatic Cut-Off Engines

TO MEET the demand for a thoroughly good and efficient automatic engine at a moderate price this company offers the line of Class "B" Standard Center-Crank Automatic Cut-Off Engines, illustrated and described on pages 14 to 19 inclusive. In their design and construction the aim has been to produce an automatic engine free from delicate or complicated parts, rendering it easily cared for, and one that will prove durable and economical in operation. The splendid favor with which they have been received, and the excellent satisfaction given by the large number in use, afford ample evidence the requirements for such an engine have been met in fullest measure.

As compared with the throttling or fixed cut-off type of engine, this Class "B" Automatic Engine affords many well-known advantages, among which may be mentioned greater economy in the use of steam, and closer speed regulation; also enables installing larger power in same space, or same power in smaller space.

The Main Frame or Bed, Crank Shaft, Piston and Rod, Cross Head and Connecting Rod are substantially of same design and construction as used on the Class "A" Engines, and illustrated and described in detail on foregoing pages. The style of Balanced Valve and Governor used is clearly illustrated and described in detail on pages 17 and 18.

An improved Single Lever Drain-Cock System for Cylinder, conducting drainage into exhaust pipe, is included with regular fixtures and furnished on all these Class "B" Engines. Regular fixtures also include one Band Fly-Wheel, containing Governor, as per list, as shown in Fig. 13 on page 15. When desired, an extra Driving Pulley can be attached to other end of engine shaft, as shown in Fig. 12 on page 14, for which an additional charge will be made, depending on size wanted.

In the Standard Engines of this Class "B" design, the aim is to produce a workmanlike and substantial piece of mechanism on which the expense for finish is limited to that point affording a consistent, pleasing and completed appearance, and beyond which no additional benefit is derived in a better quality or more satisfactory working engine. However, they are susceptible of as high polish and ornamental appearance as the higher-priced engines, and to those customers so desiring and willing to pay the additional expense we are prepared to furnish them with an extra handsome finish.

We are prepared to furnish these Class "B" Engines to run either "over" or "under," but unless otherwise ordered they are always built to run "over," that is, top of pulley to run from cylinder.

When writing us, please read "Remarks," page 55.

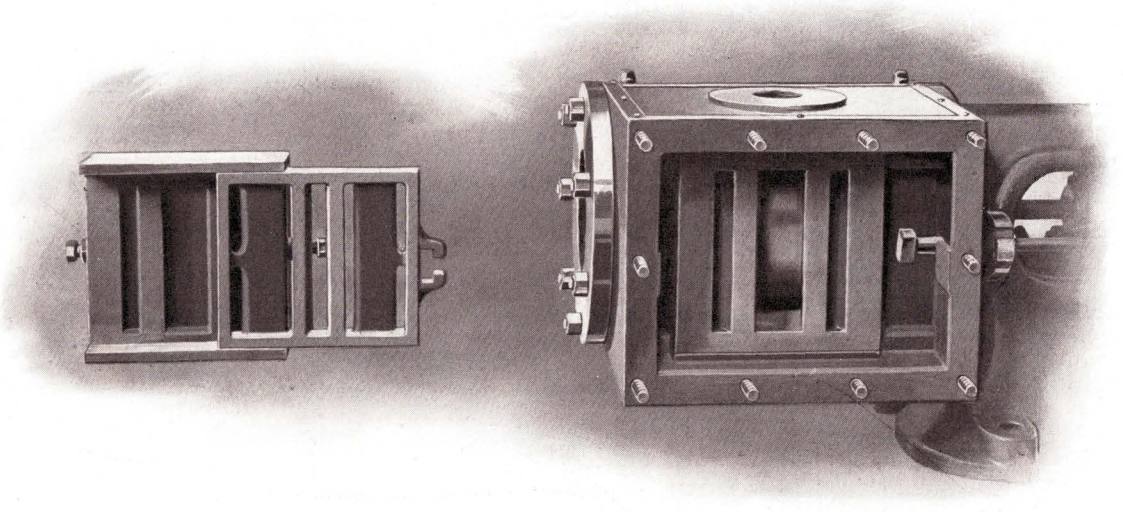


Fig. 14. Balanced Valve with Pressure-Relieving Plate, and Interior View of Steam Chest.

Fig. 14 shows interior view of Steam Chest, Balanced Valve and Pressure Plate used in all our Class "B" Engines, and all Class "A" Engines, 7 x 10 size, and larger. It is balanced by being fitted with a pressure-relieving plate on back, between valve and steam chest lid, and arranged to afford necessary relief in case of water in cylinder; also made adjustable for wear by scraping or filing the distance strips on each side at top and bottom, enabling pressure plate fitting closer to valve seat. It is less troublesome, much more simple, durable, and far superior to any other type of balanced valve.

The Governor

ILLUSTRATION Fig. 15, herewith, shows the new Improved Rites Automatic Governor furnished on these Class "B" Engines, combining the acme of simplicity with the maximum of efficiency and service. It consists of one piece, comprising the arms and weights, with one spring connection, and is pivoted on one hardened steel pin, operating in bronze-bushed hole, through hub of pulley—nothing complicated, no links, no numerous joints or delicate parts to get out of order and cause trouble; but easily handled and readily operated by any one of ordinary intelligence. This governor is a combination of the centrifugal and inertia types, and, as applied to these Class "B" Engines, it constitutes the very best engine governing practice, affording a regulation that is practically perfect, speed being constant and the same with engine loaded or running empty. Briefly stated, its action is as follows: The valve is held open by the spring until engine gets up to its normal speed, during which time centrifugal force causes the weights to gradually move and shift the eccentric to a position giving valve proper travel, and establishing an equilibrium of the parts, maintaining a constant speed. When additional load is thrown on, the tendency of engine pulley to slightly slow down in speed is not immediately communicated to the Governor, which thus lags behind a little, thereby opening the valve more and admitting the requisite additional steam to keep up the speed. The reverse is true when load is thrown off.

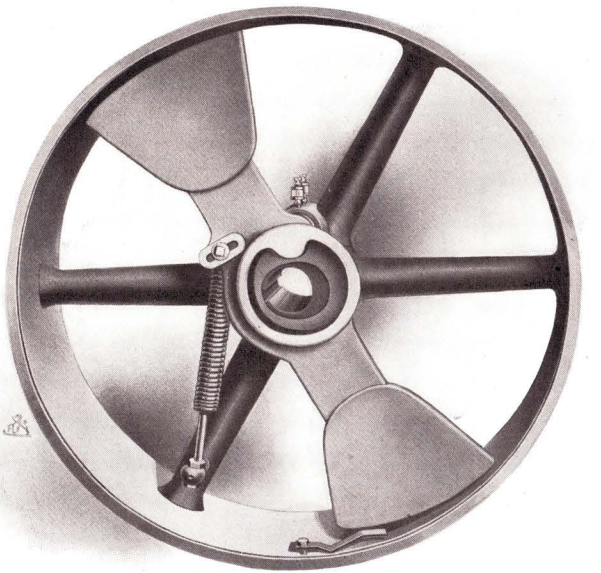


Fig. 15. Governor in Band Fly-Wheel.

Each engine, with Governor attached, is run and tested under steam pressure and brake load before shipment, insuring valve being correctly set and proper adjustment of Governor made for requisite speed regulation.

Leffel Class "B" Standard Center-Crank Automatic Cut-Off Engines

SPECIFICATIONS

Size No. of Engine	Indicated Horse Power at ¼ Cut-Off at usual number of Revolutions per Minute				Cylinder		Usual No. of Revolutions Per Minute	Band Fly Wheel		Diam. of Main Shaft Inches	Diam. of Steam Pipe Inches	Diam. of Exhaust Pipe Inches	Floor Space Engine Occupies Approximate				Approximate Shipping Weight With Sub-Base Pounds	Approximate Shipping Weight Without Sub-Base Pounds
	70 lbs. Initial Pressure	80 lbs. Initial Pressure	90 lbs. Initial Pressure	100 lbs. Initial Pressure	Diam. Inches	Stroke Inches		Diam. Inches	Face Inches				Length Ft.	Length In	Width Ft.	Width In.		
1	15 to 18	17 to 20	19 to 23	21 to 26	7	10	225 to 275	40	10½	2⅞	1½	2	6	5	3	8	2400	2100
2	19 to 24	22 to 27	25 to 31	28 to 34	8	10	225 to 275	40	10½	2⅞	2	2½	6	5	3	8	2500	2200
3	25 to 30	28 to 35	32 to 39	35 to 43	9	10	225 to 275	42	10½	3⅜	2	2½	6	9	4	2	2600	2300
4	30 to 37	35 to 43	39 to 48	44 to 54	10	10	225 to 275	42	10½	3⅜	2½	3	6	9	4	2	2700	2400
5	33 to 40	38 to 46	43 to 52	47 to 58	9½	12	225 to 275	48	12½	3⅞	2½	3	7	11	5	0	4550	4100
6	36 to 45	41 to 51	46 to 58	51 to 64	10½	12	200 to 250	48	12½	3⅞	2½	3½	7	11	5	0	4650	4200

"Regular Fixtures Complete" include: One Band Fly Wheel as per above list, containing Governor, bored, turned, balanced, keyseated, setscrewed and fitted to Shaft; Stop Valve with nipple fitted to Steam Chest, full set Oil Cups, including one each for Cross Head Pin, Crank Pin, Eccentric. Cross Head Guides, each Bearing for Main Shaft, Compression Grease Cup for Governor Pivot Pin, also Automatic Sight Feed Cylinder Lubricator, Oil Can, Wrenches, and Improved Single Lever Drain Cock System for Cylinder and Drain Cock for Steam Chest, all suitably piped into Exhaust Pipe.

Foundation Bolts, Steam and Exhaust Pipe, Cast-Iron Sub-Base, additional Band Fly Wheel, and any other extras not specifically mentioned in foregoing, are not furnished unless specially ordered and charged for extra.

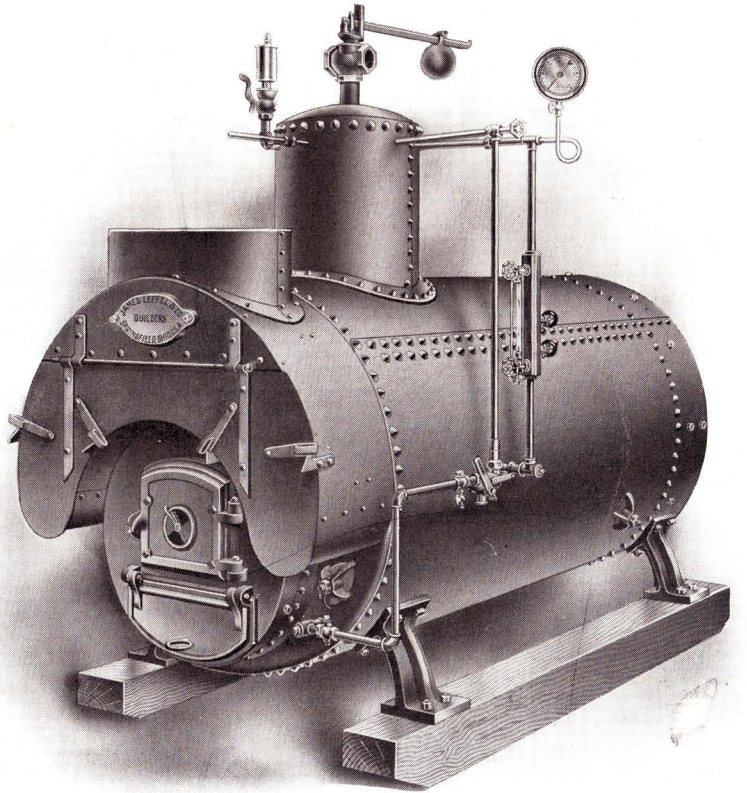


Fig. 16. Leffel Internally Fired or Self-Contained Return Tubular Portable Boiler

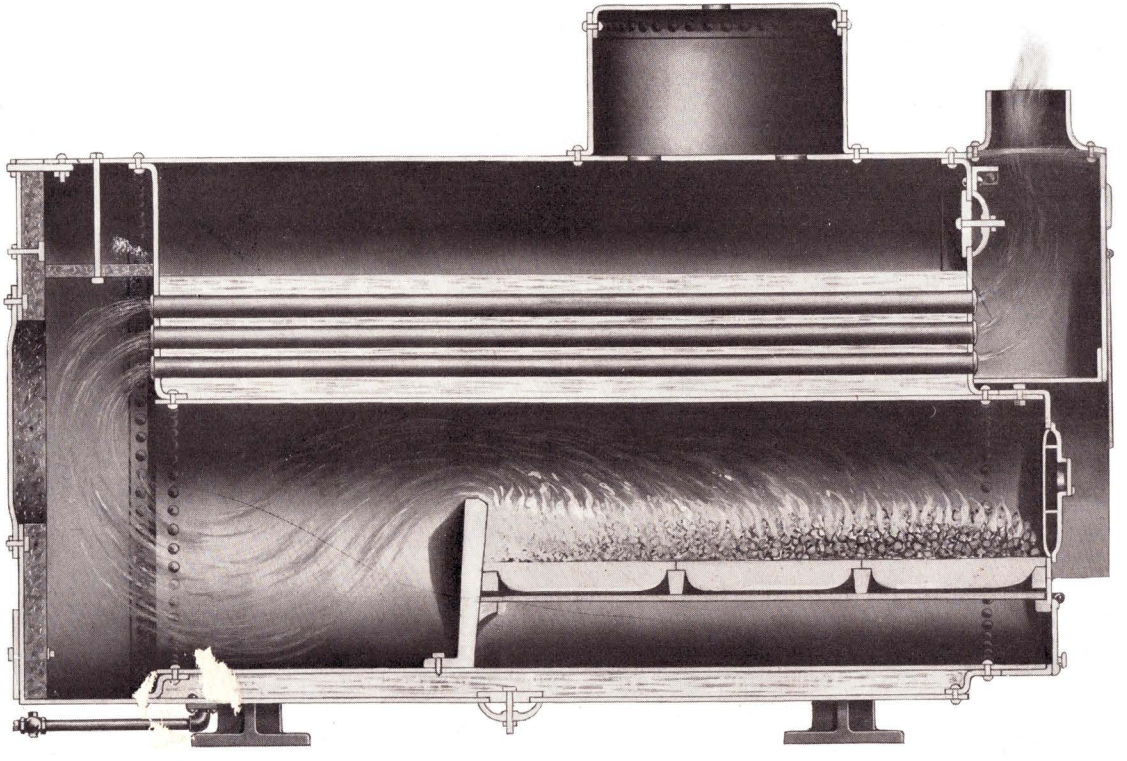


Fig 17. Sectional View showing interior construction of Leffel Internally Fired, or Self-Contained Return Tubular Portable Boiler

Leffel Internally Fired Return Tubular Portable Boilers on Skids

FIGURE 16, page 20, is exterior view, and Fig. 17, page 21, is sectional interior view, showing the Internally Fired or Self-Contained Return Tubular Portable Boiler on Skids, built in large numbers by this Company for many years past, and which has given most excellent satisfaction in all lines of work. The illustrations, Figs. 23, 24, and 25, pages 25, 26 and 27, also show exterior views of this Boiler in connection with Engine. They are entirely self-contained, mounted on skids, and do not require any foundation or setting in masonry, but are ready to start up and run when received, and can be readily moved from place to place with least trouble and expense.

In this construction of Boiler, the Fire Box consists of a large cylindrical flue inside of shell, extending full length of Boiler and entirely surrounded by water; in front end of same is placed the grates, or furnace proper, with bridge wall at back of grates, beyond which is a combustion chamber leading to tubes, through which the flames and heated gases are returned to the fire front end and pass into stack, after traversing full length of Boiler twice. There being no brick work to absorb and radiate the heat, and the fire box and tubes being entirely surrounded by water, the heat of combustion is more fully utilized for generating steam, than is possible with other styles, thus rendering them specially economical in the use of fuel. This construction also affords a Boiler of very compact form, a splendid steamer and one that is most free from escaping sparks. The absence of flat surfaces requiring numerous stay bolts found in most other portable Boilers, is another advantage of great merit. The opening of fire door does not expose or subject the tubes to inrush of cold air, so detrimental in some other styles.

We build all our Boilers of best grade Open Hearth Homogeneous Flange Steel Plate of 60,000 pounds tensile strength. This material is guaranteed to bend double when cold, when hot, or after heating red hot and plunging into water, as shown in Fig. 18, which plainly illustrates its extra strong and tough qualities. All tubes are of best lap weld quality.

The twenty-five H. P. and larger sizes each have shell in two plates with girth seam in center; shell of twenty H. P. and smaller sizes is composed of one plate only. The horizontal seam of shell is double stagger riveted in all sizes except the 6 H. P. which has single row of rivets.

Fig. 18. Leffel Boiler Plate, cold and quench bends

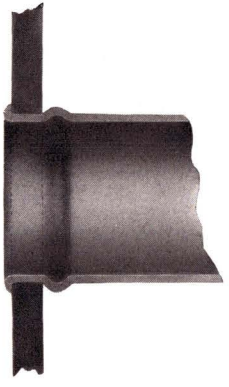


Fig. 19. Leffel way.

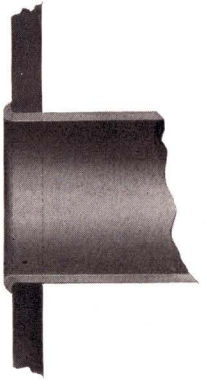


Fig. 20. Ordinary way.

Internally Fired Return Tubular Portable Boilers on Skids – Continued

Instead of punching out the tube holes in heads, as is the usual practice with builders of cheaper boilers, we carefully drill them out. This insures a good, sound head, free from check cracks or undue strains that exist in punched heads caused by force exerted in punching. Tube holes are chamfered around outer edge, affording rounding corner over which to turn bead on each tube end.

Fig. 19 shows our manner of putting in tubes, while Fig. 20 illustrates usual practice of most other builders. The superiority of our method, which expands the tube on both sides of the tube plate as well as around inner edge of hole, is plainly apparent, and tubes so put in afford most efficient bracing, are tighter, and will remain so much longer than the ordinary way shown in Fig. 20.

A blow-off pipe re-enforcing pad rightly applied is another important detail frequently overlooked by buyers and slighted or omitted by some builders. Fig. 21 shows wrong way, as hole in boiler shell is cut too large to thread and help hold pipe, and is really little better than when no re-enforcing pad is used. Fig. 22 shows right way and our way, which gives nearly double the length of thread.

same being tapped out at one operation after pad is riveted on, insuring true threads through both plates.

Outside back head of 16 H. P. and larger is lined with four inch thick fire brick wall, while said head of smaller sizes, and extended portions of shell at rear end for all sizes suitably lined with non-combustible and iron liners.

Each Boiler is thoroughly tested under 150 pounds hydrostatic pressure, also tested under full steam pressure before shipment. In obtaining one of these Boilers purchasers can rest assured of procuring one of the most carefully built, safest, most economical and very best boilers at present manufactured.

When writing us please read "Remarks," page 55.

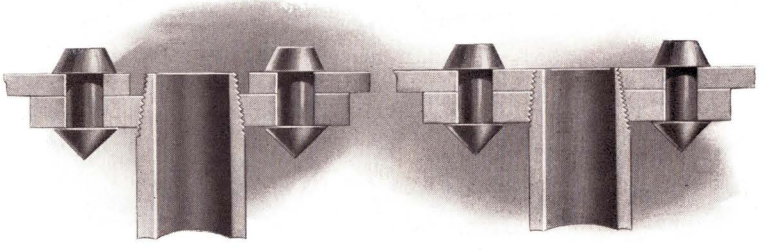


Fig. 21. Wrong way.

Fig. 22. Leffel and right way.

Leffel Horizontal Internally Fired or Self-Contained Return Tubular Portable Boilers on Skids

SPECIFICATIONS

Size-Number of Boiler	Horse Power	Shell		Fire Box			Thickness of Steel Plate			Return Tubes			Dome		Smoke Stack or Chimney		Width Boiler Over All Inches	Length Boiler Over All Inches	Approximate Shipping Weight Pounds	
		Diam. Inches	Length Inches	Diam. Inches	Length Inches	Length Grate Surface Inches	Shell Inch's	H'ds Inch's	Fire Box Inch's	Number of	Diam. Inches	Length Inches	Diam. Inches	Height Inches	Diam. Inches	Length Feet			On Skids with Regular Fixtures	On Wheels with Regular Fixtures
1	6	35	52	20	42	32	1/4	3/8	1/4	14	3	42	10	14	10	15	36	64	2000	2600
2	10	38	87	23	78	40	1/4	3/8	5/16	16	3	73	12	14	11	15	43	100	3000	3700
3	12	43	87	25	78	40	1/4	3/8	5/16	18	3	73	14	18	12	15	48	103	4300	5100
4	16	45	94	26	83	48	1/4	3/8	5/16	25	3	78	18	18	14	20	48	113	4700	5600
5	20	45	112	26	101	48	1/4	3/8	5/16	25	3	96	18	18	14	20	48	130	5200	6200
6	25	48	112	26	101	48	1/4	3/8	5/16	32	3	96	22	22	18	25	53	130	6300	7800
7	30	48	130	26	118	60	1/4	3/8	5/16	32	3	114	22	22	18	25	53	145	7000	8500
8	35	55	118	30	101	60	5/16	7/16	7/16	43	3	96	26	26	20	25	60	135	7700	9300
9	40	60	118	32	101	60	5/16	1/2	7/16	46	3	96	26	26	20	30	66	135	10500	.....
10	50	60	142	32	126	80	5/16	1/2	7/16	46	3	120	26	26	24	30	66	160	13000	.....
11	60	66	144	36	126	80	3/8	1/2	1/2	56	3	120	26	26	24	30	72	166	15500	.....
12	80	78	168	36	150	80	7/16	1/2	9/16	68	3	144	36	36	30	45	84	190	21500	.....

Regular Fixtures furnished with each Boiler on skids comprise Front or Breeching with Doors for same, Grate Bars with Bearers and Bridge wall at back end of Grate surface, Safety Valve with nipple, Combination Water Column piped up to Boiler, including Glass Water Gage, Steam Gage with Siphon and Gage Cocks, Blow-Off Valve with Elbow and Pipe connected to Boiler, Whistle and Pipe, Injector with Piping, Globe, Check and Stop Valves attached to Boiler, Smoke Stack or Chimney of length as above with Guy Wire four times length of stack, and Ash Scraper.

When desired and so ordered, Spark Arrester will be furnished in lieu of ten feet of stack with any of the above Boilers.

Any of above Boilers up to and including 35 H. P. can also be furnished mounted on four steel wheels, similar to Fig. 25, page 27, and when so furnished they are supplied with Tongue, Whiffletrees, Driver's Seat, Chain Brake, and short straight stack with Spark Arrester, or Hinged Stack without Spark Arrester, in addition to above fixtures.

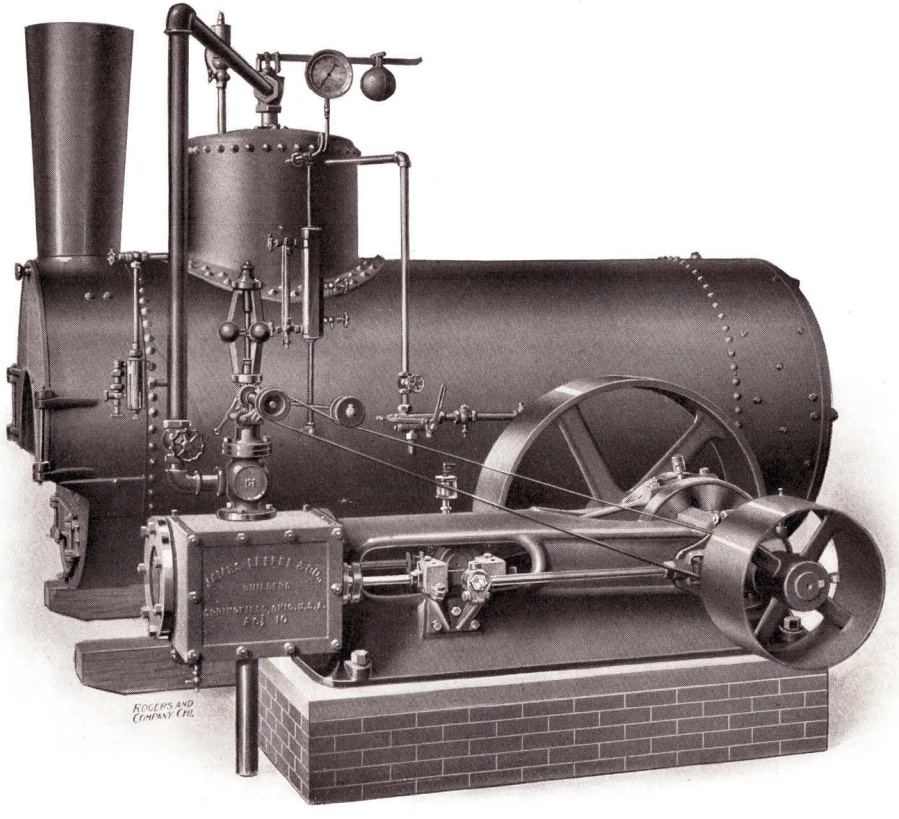


Fig. 23. Leffel Class "A" Engine and Internally Fired Boiler. Detached.

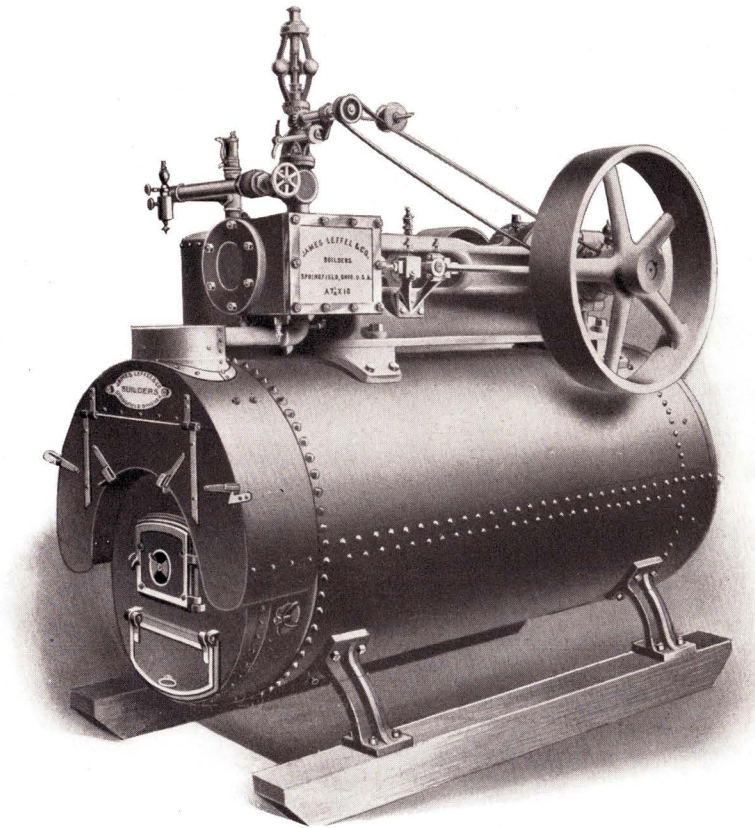


Fig. 24. Leffel Class "A" Engine and Return Tubular Boiler Combined, on Skids.

Semi-Portable Combined and Detached Class "A" Engines with Internally Fired Return Tubular Boilers

(Specifications page 28)

Fig. 24, herewith, shows our Class "A" Engine and Boiler combined on skids; same also furnished detached, as shown in Fig. 23, page 25.

In the combined outfit, engine is firmly attached to separate brackets, securely fastened to shell of boiler, and if desired at any time the engine can be easily detached and removed from boiler. Boiler fittings comprising Injector, Water Column, etc., are attached on left-hand or dome side in combined outfit.

Fig. 23, page 25, shows engine as regularly furnished detached without iron sub-base. Sub-base is not furnished unless specially ordered and charged extra for. Boiler requires no foundation other than the skids on which it is furnished. The engine, as well as boiler trimmings, can be placed on either side of boiler desired, but unless otherwise ordered, are furnished as shown on page 25. When engine is detached, the driving pulleys are interchangeable, that is, either one can be placed on either end of engine shaft desired; but when engine is mounted on boiler, pulleys are not thus interchangeable.

All sizes up to and including 35 H. P. Engine and 35 H. P. Boiler, furnished either combined, detached, or mounted on four steel wheels; larger sizes are furnished detached only.

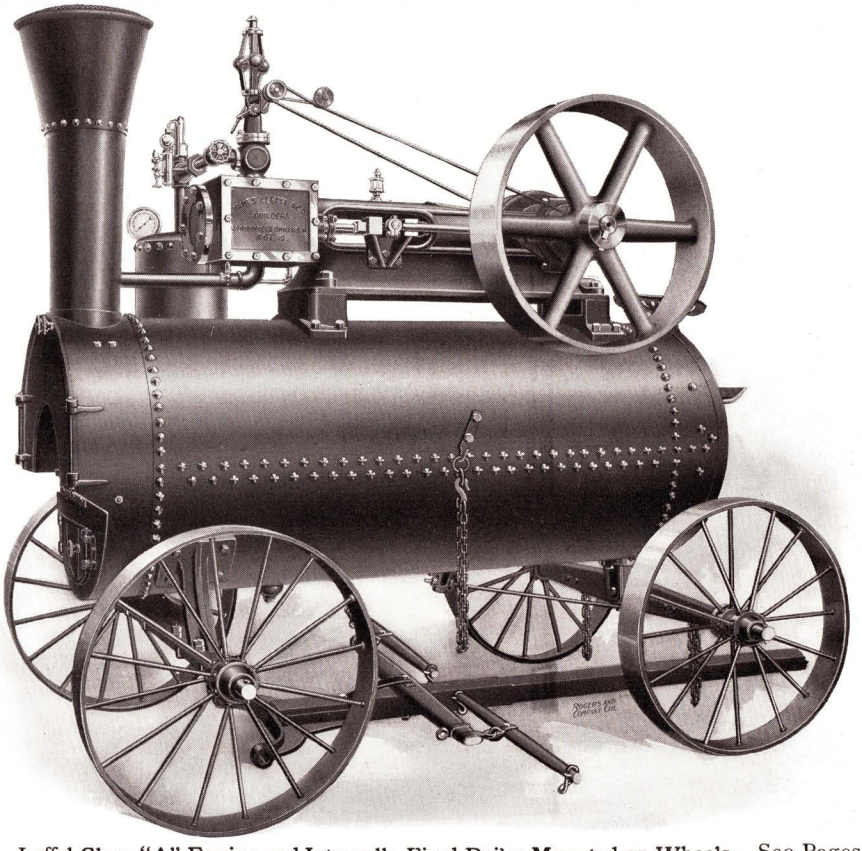


Fig. 25. **Leffel Class "A" Engine and Internally Fired Boiler Mounted on Wheels.**—See Pages 26 and 28.

Class "A" Engines and Internally Fired Return Tubular Boilers, Combined on Skids, Detached, and Mounted on Wheels

Per Figs. 23, 24 and 25, Pages 25, 26 and 27

Size Number	Engine						Boiler									
	Horse Power of Engine	Cylinder		Standard Number of Revolutions per Minute	Driving Pulleys		Horse Power of Boiler	Shell		Tubes—All 3 Inch. Diam.		Fire Box			Smoke Stack or Chimney Lth. Ft.	Approximate Shipping Weight Combined or Detached Pounds	Approximate Shipping Weight on Wheels Pounds
		Diam. Inch.	Stroke Inch.		Diam. Inches	Face Inches		Diam. Inch.	L'gth Inch.	No. of Tubes	L'gth Inch.	Diam. Inch.	L'gth Inch.	Length of Grate Surface Inches			
1	6	5	6	240	24 & 12	7 & 7	6	35	52	14	42	20	42	32	15	2600	3200
2	6	5	6	240	24 & 12	7 & 7	10	38	71	16	65	23	65	32	15	3700	4400
3	10	6	9	220	36 & 16	7 & 8	10	38	71	16	65	23	65	32	15	3900	4600
4	10	6	9	220	36 & 16	7 & 8	12	43	81	18	73	25	73	40	15	5200	5900
5	12	7	10	180	40 & 16	10½ & 8	12	43	81	18	73	25	73	40	15	6300	7100
6	15	7	10	180	40 & 16	10½ & 8	16	45	94	25	78	26	78	48	20	6800	7700
7	15	7	10	180	40 & 16	10½ & 8	20	45	112	25	96	26	96	48	20	7300	8200
8	16	8	10	180	40 & 16	10½ & 8	16	45	94	25	78	26	78	48	20	6900	7800
9	18	8	10	180	40 & 16	10½ & 8	20	45	112	25	96	26	96	48	20	7400	8400
10	20	9	10	175	42 & 18	10½ & 8	20	45	112	25	96	26	96	48	20	7500	8500
11	23	9	10	175	42 & 18	10½ & 8	25	48	112	32	96	26	96	48	25	8600	9700
12	25	10	10	175	42 & 18	10½ & 8	25	48	112	32	96	26	96	48	25	8700	10200
13	28	10	10	175	42 & 18	10½ & 8	30	48	131	32	114	26	114	60	25	9400	11000
14	30	9½	12	175	48 & 22	12½ & 10½	30	48	131	32	114	26	114	60	25	11000	12600
15	34	9½	12	175	48 & 22	12½ & 10½	35	55	120	43	96	30	96	60	25	11800	13400
16	35	10½	12	175	48 & 22	12½ & 10½	35	55	120	43	96	30	96	60	25	11900	13500
17	40	10½	12	175	48 & 22	12½ & 10½	40	60	120	46	96	32	96	60	30	14600	.....

When ordered complete, all above outfits are furnished with two Driving Pulleys as per list, Governor with Automatic Safety Stop, Speed Adjuster and Sawyer's Lever, Governor Belt, Throttle Valve, full set Oil Cups, including Automatic Sight Feed Cylinder Lubricator with connections, Oil Can, Cylinder Drain Cocks, Wrenches, Smoke Stack as above, with Guy Wire four times length of stack Grates, Safety Valve, Steam Gage with Siphon, Water Column, Glass Water Gage, Gage Cocks, Blow-Off Valve, Whistle, Injector with valves, and piping for attaching these fittings in our usual manner. When so ordered, Spark Arrester will be furnished in lieu of ten feet of stack.

Price for complete detached outfit also includes sufficient Steam Piping to set engine about three feet from side of boiler, affording ample space to conveniently pass between; also Exhaust Pipe to enter chimney.

Price for complete outfit on wheels also includes Tongue with Whiffletrees, Driver's Seat, Brake Chains, and four feet of Smoke Stack or Chimney, with Spark Arrester, or ten feet of Smoke Stack with hinge joint to lay back over boiler, without Spark Arrester, as customers prefer.

Leffel Locomotive Portable Boilers

To meet the demand existing in some sections for a Portable Boiler of the Locomotive Type, we are now putting on the market a line of these Boilers as herewith illustrated and described. Having given careful consideration to the various styles of Locomotive Portable Boilers, we have decided for best results in the majority of cases, and especially for burning the lower grades of fuel of poor quality desired to use in some places, the Water Front and Open Bottom style is by far the best and gives the most satisfactory service. We have therefore adopted this Water Front and Open Bottom type of Locomotive Boiler.

In this construction there is no dead water space below the grate surface, full of stay bolts, and which is apt to soon fill up with mud and sediment without any facilities for cleaning same out, as is found in the closed water bottom type.

Furthermore, this Water Front and Open Bottom type Boiler affords free discharge and facilities for easy removal of the ashes that fall through the grate bars into large and roomy ash pan or pit underneath fitted with adjustable top hinged door covering full front end, thus providing ample draft for all fuels, which is not the case with the closed water bottom type of Locomotive Boiler which has comparatively small ash pit door opening, rendering it difficult to remove the ashes and impairing the draft, thus making the latter Boiler not nearly so well adapted to burning the poorer grades of fuel.

Then again, our Water Front Boiler is greatly superior to the ordinary Locomotive Portable Boiler usually offered by others, and which has no water front, but is fitted with a cast-iron front which is apt to soon crack, warp and get out of shape. Also the Water Front we furnish affords a greater amount of heating surface in the fire box where heating surface is most valuable. Of course, the cast-iron front Boiler can be built and furnished for less money, but in long run it will not prove as durable, economical or as satisfactory as the Water Front type we supply.

These Boilers are all built throughout of very best grade flange steel Boiler plate, of 60,000 pounds tensile strength, guaranteed to stand tests shown in Fig. 18, page 22. The tubes are best lap weld quality thoroughly well expanded into the heads, and beaded over at both ends in workmanlike manner. The tubes are of large size, and thus not apt to clog up. Each Boiler is built and braced for a safe working pressure of 100 pounds per square inch, and is tested and made tight under 150 pounds hydrostatic pressure per square inch before shipment.

When writing for prices or ordering, please read remarks, page 55.

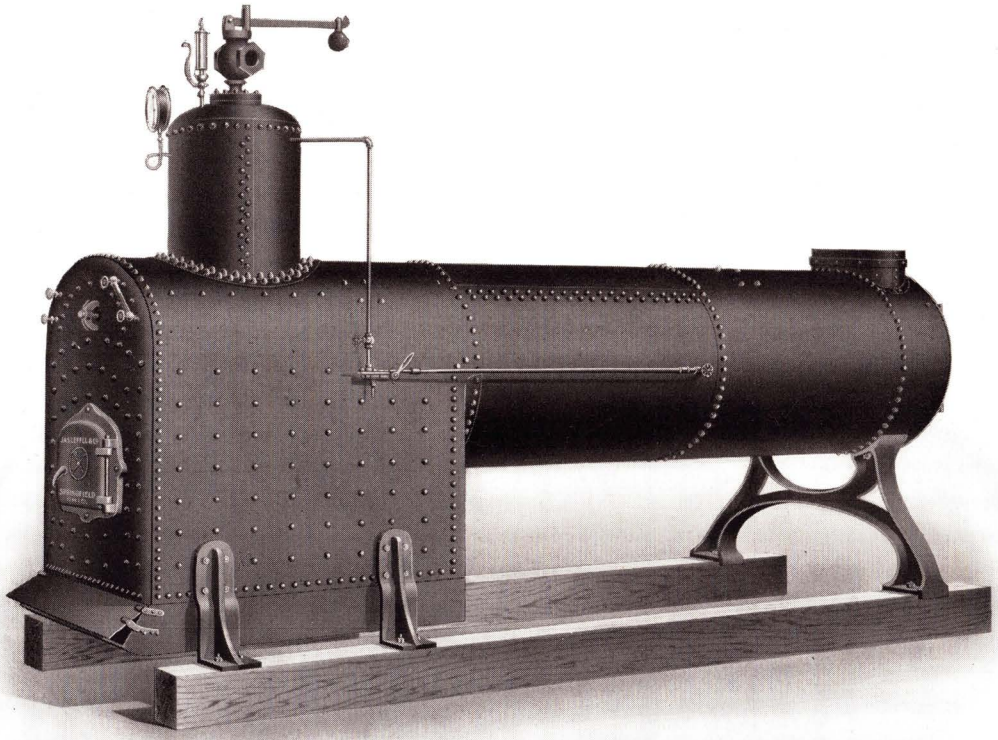


Fig. 26. Leffel Water Front Open Bottom Locomotive Portable Boiler, with Ash Pan attached

Leffel Water Front Open Bottom Locomotive Portable Boilers

SPECIFICATIONS

Size Number	Horse Power	Diam. Inches	Fire Box			Tubes			Thickness of Steel Plates			Dome		Stack or Chimney		Approximate Shipping Weight		
			Length Inches	Height Inches	Width Inches	Number of	Diam. Inches	Length Inches	Shell Inches	Fire Box Inches	Heads Inches	Diam. Inches	Height Inches	Diam. Inches	Length Feet	On Skids No Fittings Lbs.	On Skids With Fittings Lbs.	On Wheels With Fittings Lbs.
1	10	26	36	30	22	30	2	60	¼	9/32	⅜	14	14	10	15	2800	3500	4800
2	12	26	36	30	22	30	2	78	¼	9/32	⅜	14	14	12	15	3000	3700	5000
3	16	32	44	33	26	26	3	84	¼	5/16	⅜	18	18	14	20	3600	4400	5900
4	20	34	52	36	28	28	3	90	¼	5/16	⅜	18	18	14	20	4200	5200	6700
5	25	36	52	38	30	34	3	96	¼	5/16	⅜	18	18	16	25	4900	6100	7600
6	30	36	52	38	30	34	3	120	¼	5/16	⅜	18	18	16	25	5400	6600	8100
7	35	40	52	42	34	40	3	102	¼	5/16	⅜	22	22	20	25	5700	7000	8600
8	40	42	54	46	36	43	3	120	¼	5/16	⅜	22	22	20	25	7000	8400	10000
9	50	44	64	48	38	48	3	132	¼	5/16	⅜	22	22	22	30	7900	9300	.....
10	60	48	64	48	42	56	3	144	¼	5/16	⅜	24	24	24	35	9400	10900	....
11	70	54	64	52	48	60	3	150	5/16	5/16	⅜	28	28	26	35	10750	12850	.....
12	80	56	64	54	50	66	3	156	5/16	5/16	⅜	28	28	26	35	12570	14770	.....

Regular Fixtures furnished with each Locomotive Boiler on skids comprise Fire Door with Liner, Grate Bars, Ash Pan with adjustable Door fitted to front end, Smoke Box end fitted with Frame and Doors, Safety Valve with Nipple, Glass Water Gage, Gage Cocks, Blow-Off Valve with Nipple, Whistle and Pipe, Injector with Piping and Valves attached to Boiler, and Suction Hose or Pipe. Smoke Stack or Chimney of length as above, with Guy Wire four times length of Stack.

When desired and so ordered, Spark Arrester will be furnished in lieu of 10 feet of Stack with any of above Boilers.

Any of above Boilers up to and including 40-H. P., can also be furnished mounted on four Steel Wheels similar to Fig. 28, page 33.

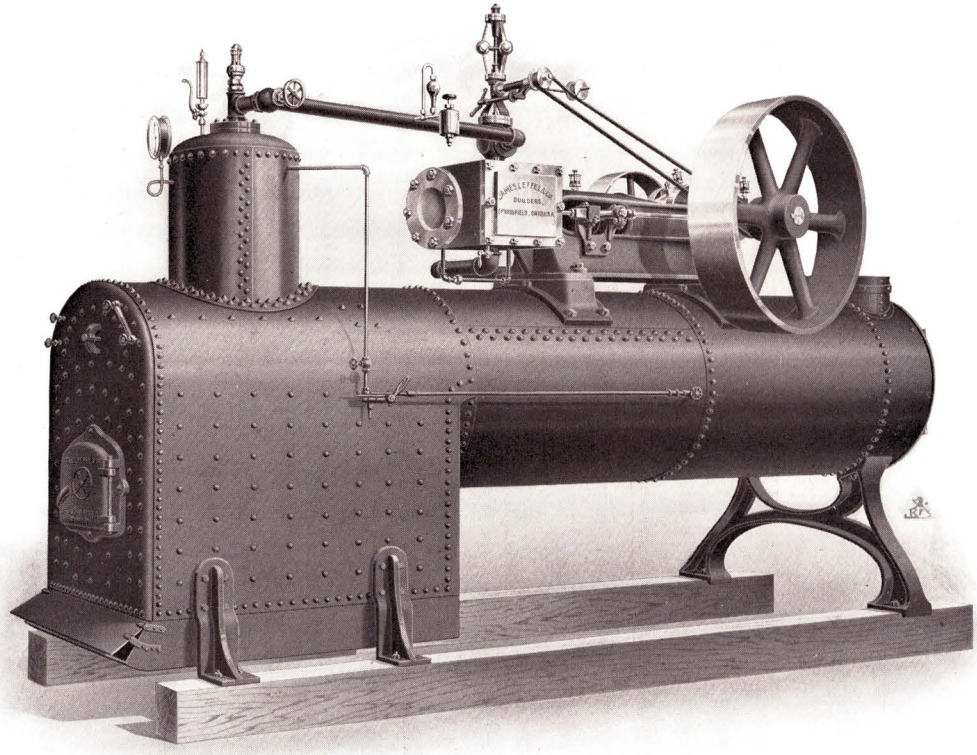


Fig. 27. Leffel Class "A" Engine and Locomotive Boiler Combined, on Skids See pages 34 and 35.

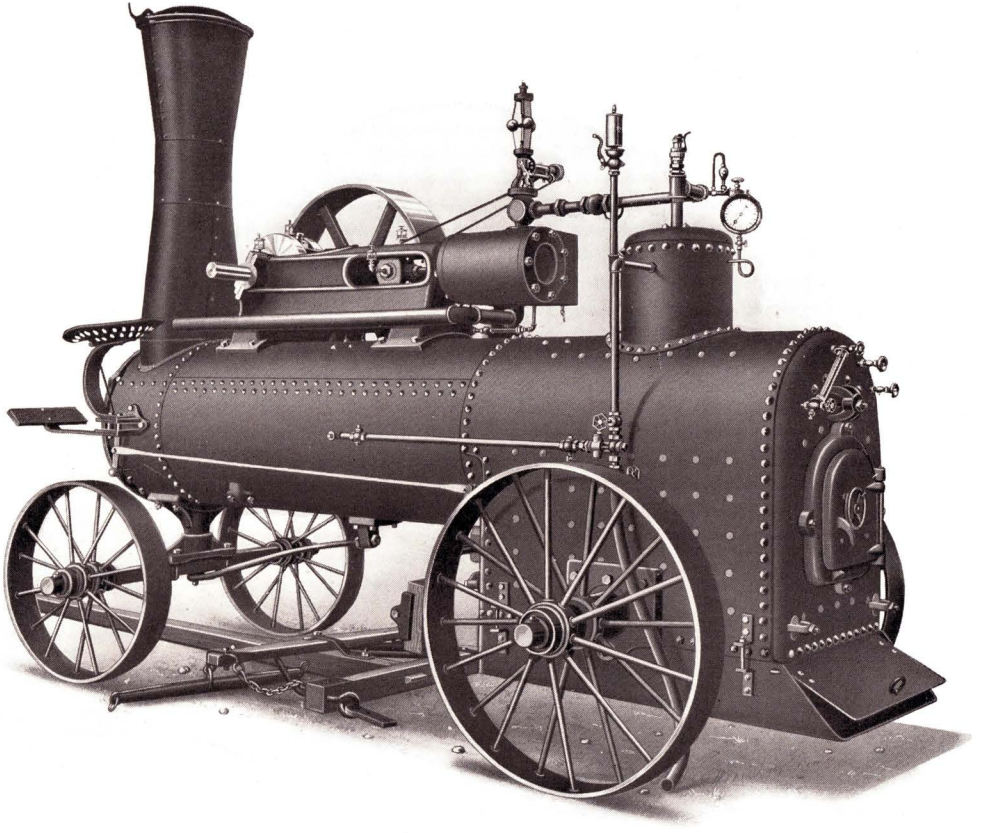


Fig. 28. Leffel Class "A" Engine and Locomotive Boiler on Wheels See pages 34 and 35.

Leffel Class "A" Engines and Locomotive Portable Boilers

Fig. 27, page 32, shows Class "A" Engine and Locomotive Portable Boiler combined on skids, and Fig. 28, page 33, shows same mounted on wheels. The Engines are of style shown and described on pages 4 to 13, and the Boilers are of the Water Front and Open Bottom style shown and described pages 29 to 31.

Illustrations Figs. 27 and 28, show Engine mounted on Boiler with large driving pulley on right-hand side, standing facing fire door end. If desired and so ordered at any time, the Engine can be mounted on Boiler with large driving pulley on the opposite or left-hand side, but unless otherwise ordered they are furnished with the large driving pulley on right-hand side as shown in Figs. 27 and 28. The Engine is firmly bolted to separate brackets securely fastened to shell of Boiler, and can be easily detached and removed from Boiler and used separately, or as a detached outfit at any time.

When outfit is ordered and furnished with Engine detached and not mounted on Boiler it is arranged for setting up similar to Fig. 23, page 25. When so furnished detached, the Engine as well as Boiler trimmings can be located on either side of Boiler desired, but unless otherwise ordered, are furnished on right-hand side. When Engine is thus detached from Boiler the driving pulleys are interchangeable, that is, either one can be placed on either end of Engine shaft desired. But when Engine is mounted on Boiler pulleys are not thus interchangeable.

All sizes up to and including 40 H.-P. Engine and Boiler furnished either combined, or detached, or mounted on four steel wheels.

When writing for prices or ordering, please read remarks, page 55.

Leffel Class "A" Engines and Locomotive Portable Boilers

SPECIFICATIONS

Size Number	Engine								Boiler									Approximate Shipping Weight	
	Horse Power of Engine	Cylinder		St'nd'rd Number of Revolutions Per Minute	Driving Pulleys				Horse Power of Boiler	Diam. Inches	Fire Box			Tubes			Smoke Stack or Chimney Length Feet	Engine and Boiler on Skids Pounds	Engine and Boiler on Wheels Pounds
		Diam. Inches	Stroke Inches		Large		Small				Length Inches	Height Inches	Width Inches	Number of	Diam. Inches	Length Inches			
					Diam. Inches	Face Inches	Diam. Inches	Face Inches											
1	6	5	6	240	24	7	12	7	10	26	36	30	22	30	2	60	15	4200	5500
2	10	6	9	220	36	7	16	8	10	26	36	30	22	30	2	60	15	4500	5800
3	10	6	9	220	36	7	16	8	12	26	36	30	22	30	2	78	15	4700	6000
4	12	7	10	180	40	10½	16	8	12	26	36	30	22	30	2	78	15	5700	7000
5	15	7	10	180	40	10½	16	8	16	32	44	33	26	26	3	84	20	6400	7900
6	15	7	10	180	40	10½	16	8	20	34	52	36	28	28	3	90	20	7200	8700
7	16	8	10	180	40	10½	16	8	16	32	44	33	26	26	3	84	20	6500	8000
8	18	8	10	180	40	10½	16	8	20	34	52	36	28	28	3	90	20	7300	8800
9	20	9	10	175	42	10½	18	8	20	34	52	36	28	28	3	90	20	7400	8900
10	23	9	10	175	42	10½	18	8	25	36	52	38	30	34	3	96	25	8300	9800
11	25	10	10	175	42	10½	18	8	25	36	52	38	30	34	3	96	25	8400	9900
12	28	10	10	175	42	10½	18	8	30	36	52	38	30	34	3	120	25	8900	10400
13	30	9½	12	175	48	12½	22	10½	30	36	52	38	30	34	3	120	25	10900	12400
14	34	9½	12	175	48	12½	22	10½	35	40	52	42	34	40	3	102	25	11300	12900
15	35	10½	12	175	48	12½	22	10½	35	40	52	42	34	40	3	102	25	11400	13000
16	40	10½	12	175	48	12½	22	10½	40	42	54	46	36	43	3	120	25	12800	14400

When ordered complete, all above outfits are furnished with two Driving Pulleys as per list, Governor with Automatic Safety Stop, Speed Adjuster and Sawyer's Lever, Governor Belt, Throttle Valve, full set Oil Cups, including Automatic Sight Feed Cylinder Lubricator with connections, Oil Can, Cylinder Drain Cocks, Wrenches, Smoke Stack as above, with Guy Wire four times length of stack, Grates, Ash Pan, Safety Valve, Steam Gage with Siphon, Water Column, Glass Water Gage, Gage Cocks, Blow-Off Valve, Whistle, Injector with valves, and piping for attaching these fittings in our usual manner. When so ordered Spark Arrester will be furnished in lieu of ten feet of stack.

Price for complete detached outfit also includes sufficient Steam Piping to set engine about three feet from side of boiler, affording ample space to conveniently pass between; also twelve feet Exhaust Pipe.

Price for complete outfit on wheels also includes Tongue with Whiffletrees, Driver's Seat, Friction Brake to operate with Lever from Driver's Seat, and four feet of Smoke Stack or Chimney, with Spark Arrester, or ten feet of Smoke Stack with Hinge Joint to lay back on boiler without Spark Arrester, as customers may prefer, also Ash Pan attached.

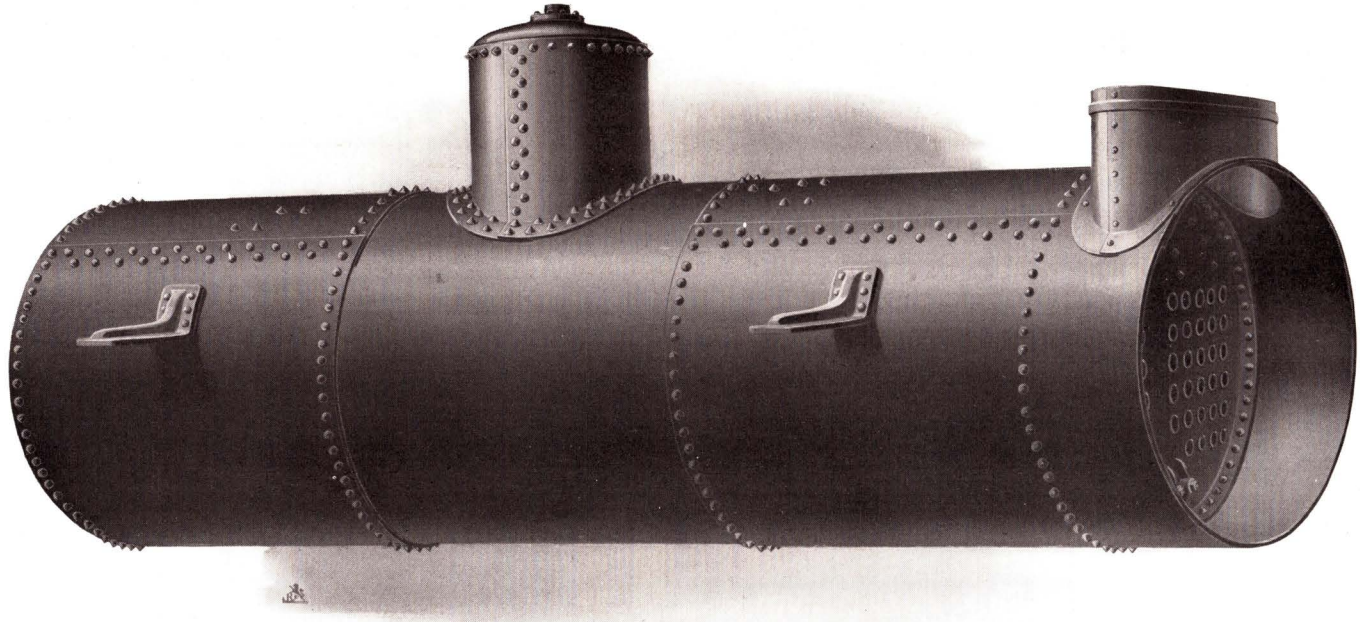


Fig. 29. Leffel Standard Tubular Stationary Boiler.

Leffel Standard Tubular Stationary Boilers

These Boilers are of the well-known Tubular Stationary pattern, for setting in brickwork or masonry, as illustrated in Figs. 29 and 30, pages 36 and 38. They are built in most workmanlike manner throughout of Open Hearth Homogeneous Flange Steel Plate of 60,000 pounds tensile strength. The longitudinal seams of shell are double stagger riveted. The tubes are best lap weld quality, and are located in vertical and horizontal rows, so spaced as to afford best circulation within the boiler. The heads are thoroughly braced, and each boiler is built for 100 pounds safe working pressure, and carefully tested under 150 pounds hydrostatic pressure before shipment. The 20 to 40 Horse Power inclusive have Eclipse Man Hole in rear head above tubes, and Hand Hole in front head below tubes; larger sizes have Eclipse Man Hole in both heads. They are confidently offered as fulfilling in highest measure every requirement of this type of stationary boiler.

SPECIFICATIONS

Size Number	Rated Horse Power	Shell		Thickness of Steel Plate		Tubes			Dome		Grate Surface		Stack		Shipping Weight (Approximate Pounds)	
		Diam. Inches	Length Feet	Shell Inches	Heads Inches	Number of	Diam. Inches	Length Feet	Diam. Inches	Height Inches	Length Inches	Width Inches	Diam. Inches	Length Feet	Boiler Alone	Boiler and Fixtures
1	15	36	8	1/4	3/8	22	3	8	18	18	36	36	14	25	2300	4100
2	20	36	10	1/4	3/8	24	3	10	18	18	36	36	14	28	2700	4500
3	25	36	12	1/4	3/8	24	3	12	18	18	42	36	16	30	3100	5100
4	30	40	12	1/4	3/8	30	3	12	22	22	42	42	18	30	3900	6000
5	35	42	12	1/4	3/8	36	3	12	22	22	42	42	20	30	4200	6500
6	40	44	14	1/4	3/8	28	3 1/2	14	22	22	48	42	20	35	4900	7000
7	45	48	12	1/4	7/16	46	3	12	24	24	48	42	24	35	5100	8300
8	50	48	14	1/4	7/16	34	3 1/2	14	24	24	54	42	24	40	5700	9000
9	60	54	14	5/16	7/16	46	3 1/2	14	28	28	48	48	26	40	7500	11500
10	70	54	16	5/16	7/16	34	4	16	28	28	54	48	26	45	8400	12000
11	80	60	16	5/16	7/16	44	4	16	30	30	54	54	28	45	10200	14600
12	100	66	16	3/8	7/16	54	4	16	34	34	54	60	32	45	12800	17800

Regular Fixtures comprise: Front with Doors and Liners, Grate Bars with Bearers, Back Wall Plate, Soot Door and Frame, Smoke Stack as above, Guy Wire four times length of stack, Combination Water Column, including Glass Water Gage, Steam Gage with Siphon and Gage Cocks, Safety Valve, Blow-off Cock with Piping for same, and Whistle.

All standard Tubular Stationary Boilers are furnished with Lugs or Loops, and Smoke Box is formed by extension of Shell, and all are suitable for either Full Flush or Half Arch Front Setting.

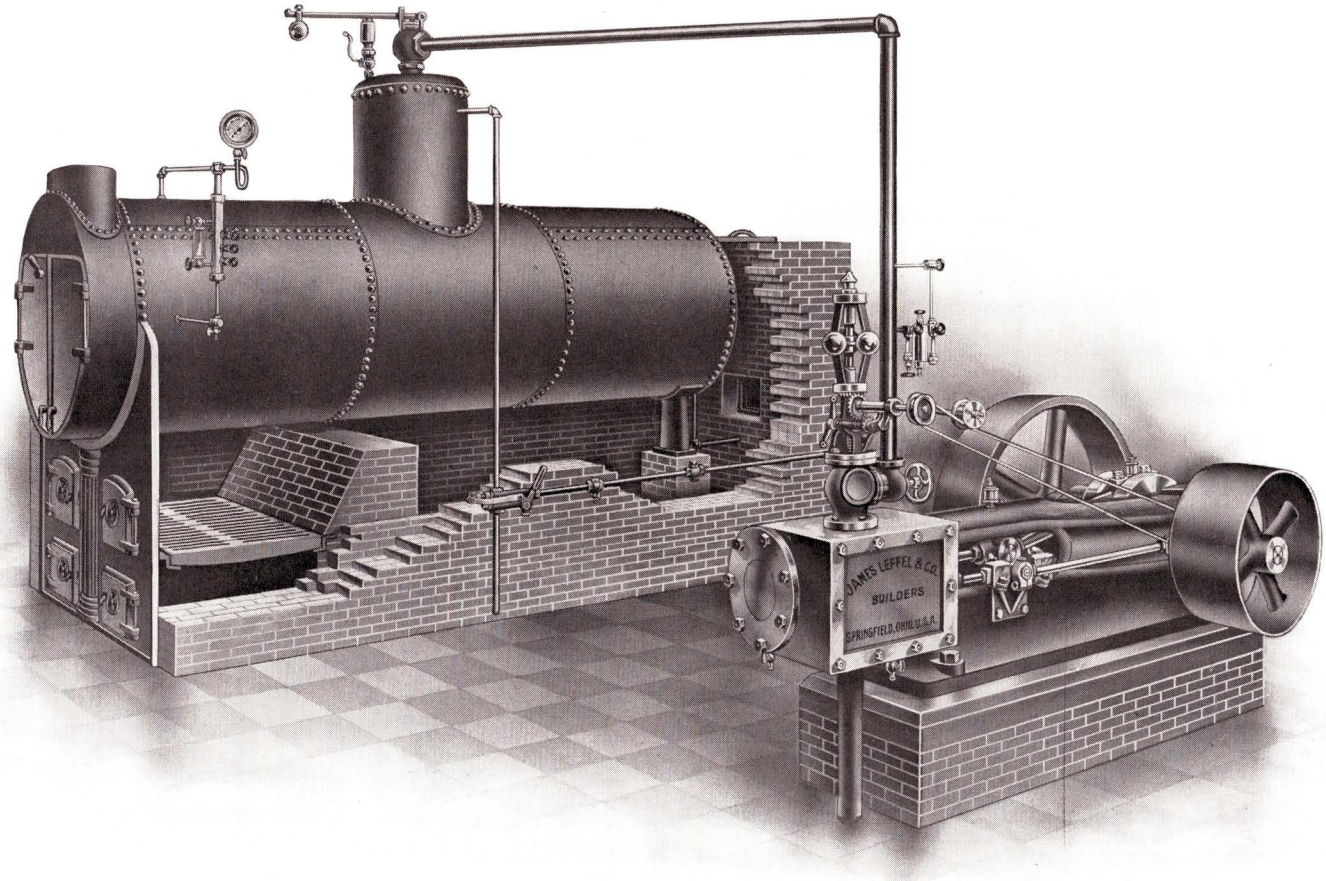


Fig. 30. Leffel Class "A" Engine with Stationary Tubular Boiler with Half Arch Front Setting

Leffel Class "A" Engines with Stationary Boilers

Fig. 30, page 38, shows Class "A" Engine and Stationary Boiler with half arch front setting. Engine and Boiler fittings can be located on either side of boiler desired, but unless otherwise ordered, are furnished on side shown in Fig. 30. Driving pulleys can be used on either end of engine shaft, and belt run either forward or backward from either pulley.

SPECIFICATIONS

	Engine						Boiler								Approximate Shipping Weight Engine and Boiler Pounds
		Cylinder		Standard Number of Revolutions per Minute	Driving Pulleys			Shell		Tubes			Dome		Length of Smoke Stack or Chimney Feet	
Size No	Horse Power of Engine	Diam. Inches	Stroke Inches		Diameter Inches	Face Inches	Horse Power of Boiler	Diam. Inches	Length Feet	No. of Tubes	Diam. Inches	Length Feet	Diam. Inches	Height Inches		
1	10	6	9	220	36 & 16	7 & 8	15	36	8	22	3	8	18	18	25	5100
2	15	7	10	180	40 & 16	10½ & 8	15	36	8	22	3	8	18	18	25	6200
3	15	7	10	180	40 & 16	10½ & 8	20	36	10	24	3	10	18	18	28	6600
4	18	8	10	180	40 & 16	10½ & 8	20	36	10	24	3	10	18	18	28	6700
5	20	9	10	175	42 & 18	10½ & 8	20	36	10	24	3	10	18	18	28	6900
6	23	9	10	175	42 & 18	10½ & 8	25	36	12	24	3	12	20	20	30	7400
7	25	10	10	175	42 & 18	10½ & 8	25	36	12	24	3	12	20	20	30	7600
8	28	10	10	175	42 & 18	10½ & 8	30	40	12	30	3	12	22	22	30	8400
9	30	9½	12	175	48 & 22	12½ & 10½	30	40	12	30	3	12	22	22	30	10000
10	34	9½	12	175	48 & 22	12½ & 10½	35	42	12	36	3	12	22	22	30	10600
11	35	10½	12	175	48 & 22	12½ & 10½	35	42	12	36	3	12	22	22	30	10800
12	40	10½	12	175	48 & 22	12½ & 10½	40	44	14	28	3½	14	22	22	35	11800

When ordered complete, regular fixtures furnished with above outfits include two Driving Pulleys, as listed, Governor with Automatic Safety Stop, Speed Adjuster and Sawyer's Lever, Governor Belt, Throttle Valve, full set Oil Cups, including Automatic Sight Feed Cylinder Lubricator with connections, Oil Can, Cylinder Drain Cocks, Wrenches, Front with Doors, Grate Bars with Bearers, Back Wall Plate, Soot Door and Frame, Smoke Stack of length stated above, and Galvanized Guy Wire four times length of stack, Combination Water Column piped to boiler, including Glass Water Gage, Steam Gage with Siphon, and Gage Cocks, Safety Valve and Nipple, Blow-Off Valve with usual piping for same, Whistle and six feet of whistle pipe; also good Injector with piping and valves connected up to boiler, necessary steam piping to set center of engine 8 to 12 feet from center of boiler, and 12 feet of Exhaust Pipe, latter to extend in horizontal or vertical direction as may be desired.

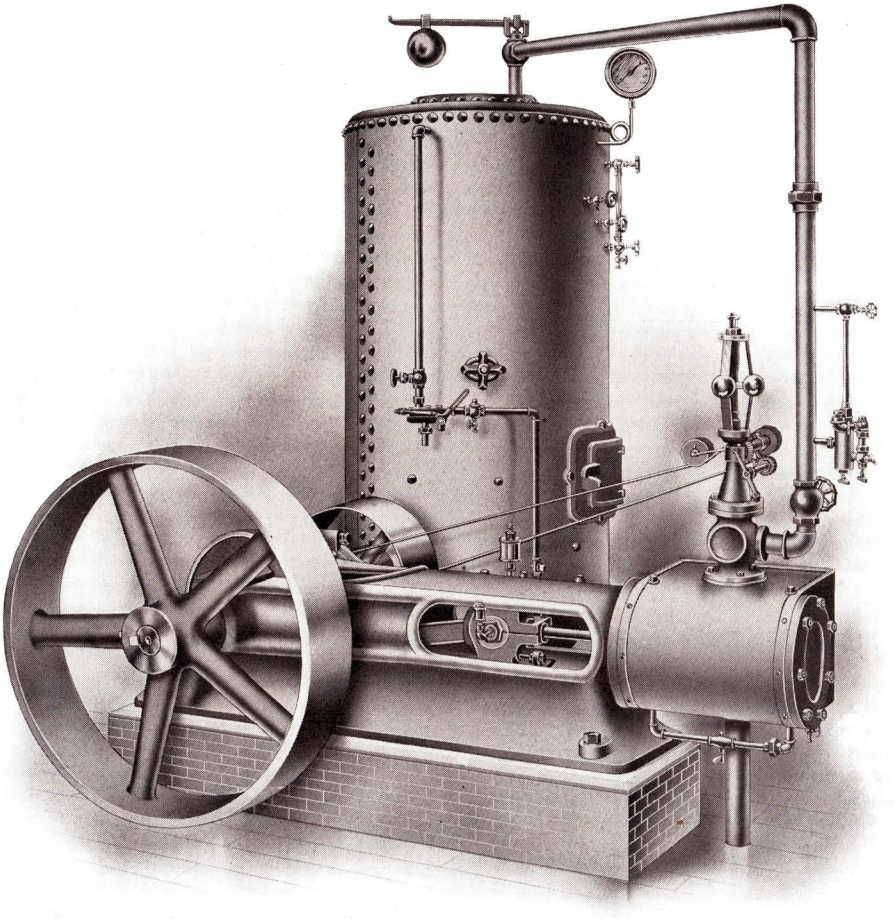


Fig. 31. Leffel Class "A" Engine with Vertical Boiler. See Pages 42 and 43.

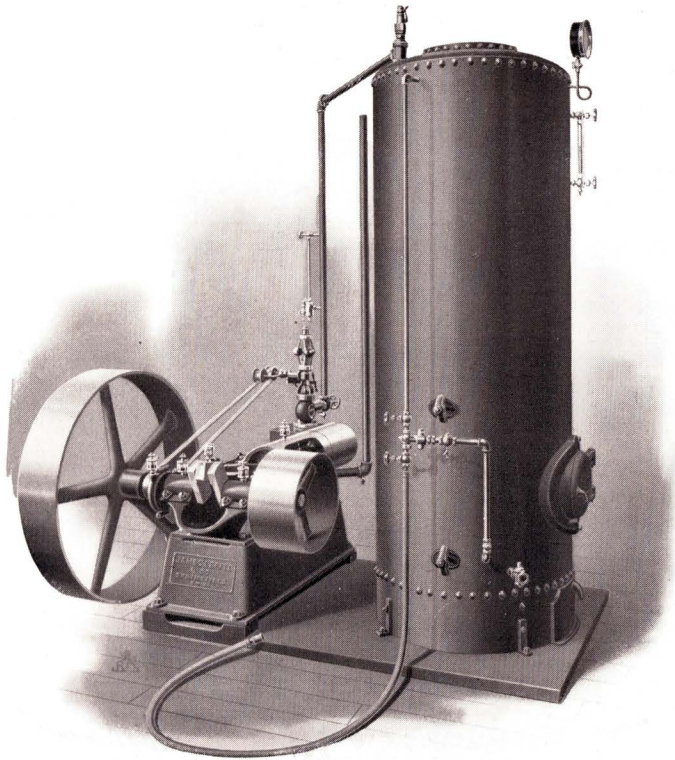


Fig. 32. **Leffel Class "A" Engine on Sub-Base and Vertical Boiler, on Combination Iron Base.** See Pages 42 and 43.

Leffel Class "A" Engines and Vertical Boilers

Fig. 31, page 40, shows 7x10 Class "A" Engine with Vertical Boiler detached, the Boiler being furnished on its regular base and the Engine set on separate foundation.

Fig. 32, page 41, shows 6x9 Class "A" Engine on sub-base with Vertical Boiler all mounted on combination cast-iron base, thus not requiring any foundation for setting same up and making a very convenient outfit for easily moving and quickly setting.

Outfit of style shown in Fig. 31, can be furnished to set Engine any reasonable distance from Boiler; but in Fig. 32 outfit, Engine and Boiler being on same base must be close together. However, as Fig. 32 outfit does not require any foundation it is preferable in many cases.

The Engines are same as illustrated and described pages 4 to 13, and the Boilers can be furnished either of the Submerged Tube Type shown in Fig. 33, or Full-Length Tube type shown in Fig. 34, page 44, and description and specifications of which are found pages 45 to 47.

Where frequent moving of outfit is desired, and the facilities for handling and setting are not very good, we have sometimes furnished outfit on combination base, as shown in Fig. 32, excepting the Boiler equipped with tongue and whiffletrees and fitted with axles and furnished with wheels for mounting similar to Fig. 36, page 49. This enables making separate loads of the Engine, its sub-base and the combination base, while the Boiler is moved on its own wheels; and this sub-dividing renders the outfit easily transported and set with least trouble and in quickest time.

We are prepared to furnish any of our Horizontal Engines with Vertical Boilers in either of foregoing styles and in a large variety of combinations. Should specifications on page 43 not contain just the combination of Engine and Boiler desired, we will be pleased to submit specifications and prices on any other combination that may be wanted.

When writing for prices or ordering, please read Remarks page 55.

Leffel Class "A" Engines with Vertical Submerged Tube Boilers

SPECIFICATIONS

Size Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Horse Power of Boiler	7	10	15	18	20	20	25	25	30	30	35	35	40
Horse Power of Engine	6	10	15	16	18	20	23	25	28	30	34	35	40
Size of Cylinder . . . . . Inches	5 x 6	6 x 9	7 x 10	8 x 10	8 x 10	9 x 10	9 x 10	10 x 10	10 x 10	9½ x 12	9½ x 12	10½ x 12	10½ x 12
Standard Number of Revolutions per Minute	240	220	180	180	180	175	175	175	175	175	175	175	175
Approximate Shipping Weight Engine and Boiler . . . . . Pounds	2200	2700	4400	5100	5500	5600	6500	6700	7900	9500	9800	9900	10200

Leffel Class "A" Engines with Full Length Tube Vertical Boilers

SPECIFICATIONS

Size Number	20	21	22	23	24	25	26	27	28	29	30	31	32
Horse Power of Boiler	7	10	15	18	20	20	25	25	30	30	35	35	40
Horse Power of Engine	6	10	15	16	18	20	23	25	28	30	34	35	40
Size of Cylinder . . . . . Inches	5 x 6	6 x 9	7 x 10	8 x 10	8 x 10	9 x 10	9 x 10	10 x 10	10 x 10	9½ x 12	9½ x 12	10½ x 12	10½ x 12
Standard Number of Revolutions per Minute	240	220	180	180	180	175	175	175	175	175	175	175	175
Approximate Shipping Weight Engine and Boiler . . . . . Pounds	2400	2900	4600	5200	6200	6300	6700	6800	7000	8600	9800	9900	10200

When ordered complete, regular fixtures furnished with above outfits include two Driving Pulleys as listed, page 13, Governor with Automatic Safety Stop, Speed Adjuster and Sawyer's Lever, Governor Belt, Throttle Valve full set of Oil Cups, including Automatic Sight Feed Cylinder Lubricator with connections, Oil Can, Cylinder Drain Cocks, Wrenches, Fire Door, Ash Pit Door, Base, Grates, Steam Gage with Siphon, Glass Water Gage, Gage Cocks, Blow-Off Valve, Safety Valve, good Injector attached for feeding water into boiler, and usual Steam and Exhaust Piping.

Smoke Stack, Spark Arrester, Whistle, and Iron Sub-Base for engine are not furnished unless specially ordered and charged for extra.

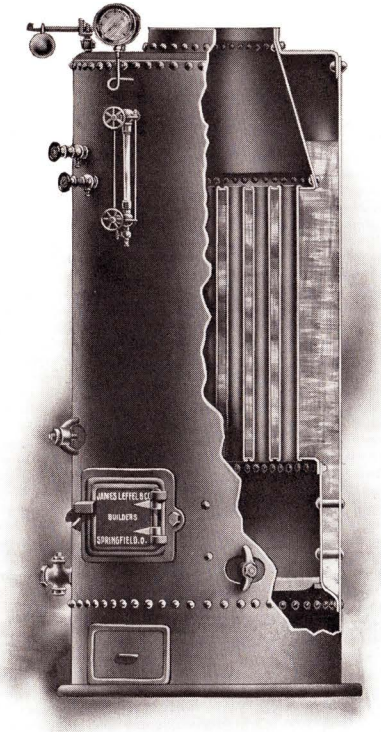


Fig. 33. Partial Sectional View Showing Interior Construction Vertical Boiler with Submerged Tubes.

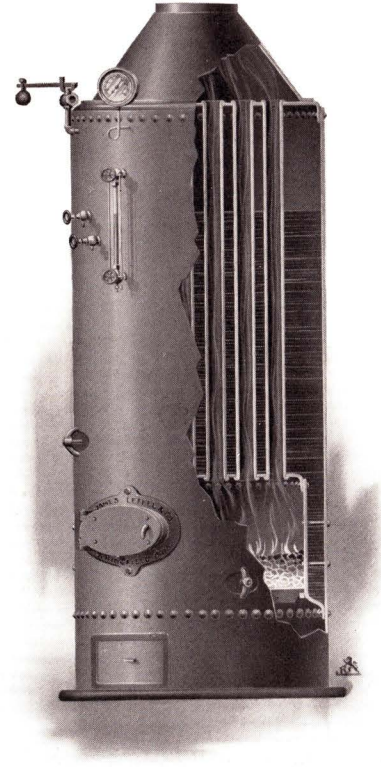


Fig. 34. Partial Sectional View Showing Interior Construction Full Length Tube Vertical Boiler.

Leffel Vertical Boilers

Figs. 33 and 34, page 44, illustrate the two styles of Vertical Boilers now built by this Company. The material throughout is best grade Open Hearth Homogeneous Flange Steel Plate, of 60,000 pounds tensile strength, guaranteed to stand tests shown in Fig. 18, page 22. The tubes are best lap weld quality, thoroughly well expanded into the heads in most workmanlike manner and beaded over at both ends, as shown in Fig. 19, page 23. As cuts show, a water space is provided around the sides of the fire box, and threaded stay bolts screwed in and riveted over at both ends to brace the furnace sheet to shell. Convenient handholes are provided in shell above lower tube sheet, and at bottom of water leg around fire-box to facilitate cleaning out. Each Boiler is tested and inspected under 150 pounds hydrostatic pressure per square inch, and made tight under that pressure before shipment.

It will be seen, in the Submerged Tube Boiler the upper tube sheet and entire length of tubes are below the water line and submerged in water, greatly increasing their durability. By putting in an extra head at top, as we do in this Boiler, and riveting dome sheets to flanged nozzle in center of same as shown in Fig. 33, making the dome cone shaped, extra and abundant steam room is provided, insuring dry steam and better enabling using steam for heating water, cooking feed, or other purposes in addition to running Engine.

In the plain Vertical or Full Length Tube Boiler the upper tube head serves as top head for the Boiler, and said upper tube head and the upper ends of the tubes are thus above the water line. We consider the Submerged Tube Boiler as built by us the best Vertical boiler on the market, but there being a demand for a cheaper style, we are prepared to supply same in the full Length Tube Pattern, which is less costly to build and can be sold at lower figures.

When writing for prices or ordering, please read and observe Remarks, page 55.

Leffel Submerged Tube Vertical Boilers

SPECIFICATIONS

Size Number		1	2	3	4	5	6	7	8	9	10	11
Horse Power		3	5	7	10	15	18	20	25	30	35	40
Diameter Shell	Inches	25	28	30	30	36	36	42	42	48	48	48
Height Shell	"	58	64	73	92	92	104	104	116	110	116	128
Diameter Fire Box	"	20	23	24	24	31	31	36	36	42	42	42
Height Fire Box	"	20	22	24	28	30	30	30	30	30	30	30
Number of 2-inch Diam. Tubes		31	42	48	48	68	68	85	85	132	132	132
Length Tubes	Inches	16	18	24	38	38	48	48	60	45	51	63
Thickness Shell Plate	"	¼	¼	¼	¼	¼	¼	¼	¼	¼	¼	¼
Thickness Fire-Box Plate	"	9/32	9/32	9/32	9/32	5/16	5/16	5/16	5/16	5/16	5/16	5/16
Thickness Heads	"	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	7/16	7/16	7/16
Thickness Cone	"	9/32	9/32	9/32	9/32	5/16	5/16	5/16	5/16	5/16	5/16	5/16
Diameter Stack or Chimney	"	9	9	9	10	14	14	16	16	20	20	24
Weight Boiler, no Fixtures	Pounds	670	900	1100	1450	1930	2000	2600	3250	4000	4200	4600
Weight Boiler and Fixtures	"	1000	1200	1400	1700	2400	2900	3400	4300	5500	5700	6100

Regular Fixtures comprise Fire Door and Frame, Ash Pit Door, Base, Grates, Steam Gage with Siphon and Cock, Glass Water Gage, Gage Cocks, Blow-Off Cock and Nipple, Safety Valve and Nipple, good Injector with Piping and Valves attached for feeding water into boiler, with six feet Suction Hose Fitted with Strainer.

Smoke Stack, Spark Arrester and Whistle are not furnished unless specially ordered and charged for extra.

Leffel Full Length Tube or Plain Vertical Boilers

SPECIFICATIONS

Size Number		20	21	22	23	24	25	26	27	28	29	30
Horse Power		3	5	7	10	15	18	20	25	30	35	40
Diameter Shell	Inches	24	24	30	30	36	36	42	42	42	48	48
Height Shell	"	56	68	68	80	92	104	96	108	120	96	108
Diameter Fire Box	"	20	20	24	24	31	31	37	37	37	43	43
Height Fire Box	"	24	24	27	27	30	30	30	30	30	30	30
Number of 2-inch Diam. Tubes		24	24	42	42	61	61	79	79	79	138	138
Length Tubes	Inches	24	36	33	45	54	66	66	78	90	66	78
Thickness Shell Plate	"	¼	¼	¼	¼	¼	¼	¼	¼	¼	¼	¼
Thickness Fire Box Plate	"	¼	¼	¼	¼	9/32	9/32	5/16	5/16	5/16	5/16	5/16
Thickness Heads	"	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	7/16	7/16
Diameter Stack or Chimney	"	9	9	9	10	14	14	16	16	20	20	20
Weight Boiler, no Fixtures	Pounds	900	1000	1300	1500	2000	2500	3200	3500	3800	4000	4500
Weight Boiler and Fixtures	"	1200	1300	1600	1800	2400	2900	4000	4300	4500	5500	6000

Regular Fixtures comprise Fire Door and Frame, Ash Pit Door, Base, Grates, Steam Gage with Siphon and Cock, Glass Water Gage, Gage Cocks, Blow-Off Cock and Nipple, Safety Valve and Nipple, good Injector with Piping and Valves attached for feeding water into boiler, with six feet Suction Hose fitted with Strainer.

Smoke Stack, Spark Arrester, and Whistle are not furnished unless specially ordered and charged for extra.

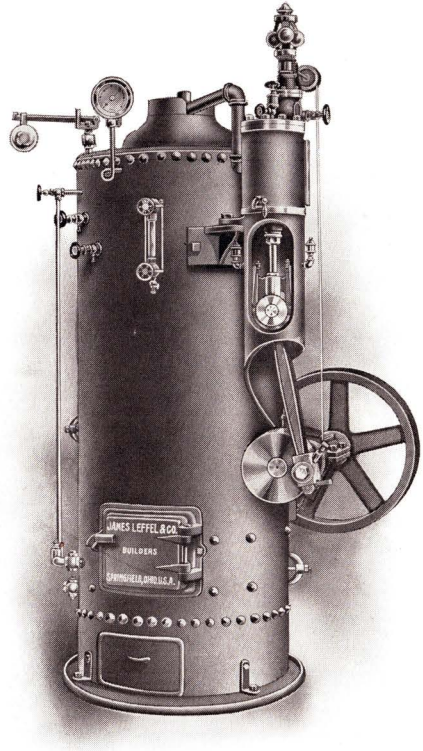


Fig. 35. Side View of Upright Engine and Boiler.

Leffel Vertical Engines and Boilers Combined on Base

Fig. 35 herewith shows side view of our Vertical Engine attached to either Submerged Tube or Full Length Tube Vertical Boiler. The Engine frame, or bed, with cross-head guides, cylinder and steam chest, is cast in one solid piece, affording greatest strength and rigidity. The Engine is bolted to brackets which are separately attached to Boiler. The cylinder and guides are bored out in exact line in one operation, and cylinder is furnished with non-conductor covering and fitted with steel jacket. Piston is provided with self-adjusting metallic packing rings. Piston rod, valve rod and main shaft are of steel. Specifications, page 50, give dimensions of regular driving pulley furnished when not otherwise ordered; the size driving pulley can be varied within reasonable bounds. The 3 or 5 H-P. Engine can be attached to the 7 H-P. Boiler, or the 3 H-P. Engine to the 5 H-P. Boiler, or the 5 or 7 H-P. Engine to the 10 H-P. Boiler. The Boilers with these outfits are same as illustrated Figs. 33 and 34, described pages 45, 46 and 47. By reference to specifications, page 50, it will be seen these Engines and Boilers are of much more ample dimensions and consequently greater capacity than most other builders furnish for about the same rated power. Each outfit is run and tested under full steam pressure and load before shipment. The round flat cast-iron base has curved rim, and covers all the space underneath the Boiler.

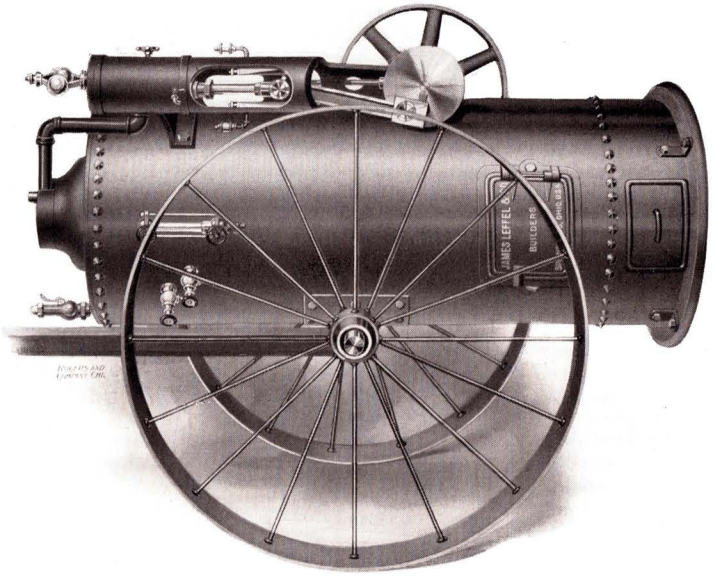


Fig. 36

Leffel Portable Vertical Engines and Boilers

Fig. 36 herewith shows manner in which we are prepared to furnish our Vertical Engines with either Submerged Tube or Full Length Tube Vertical Boilers mounted on two strong steel wheels, making a good and fairly convenient as well as comparatively cheap Portable Engine and Boiler. The Engine and Boiler are of same style and construction as illustrated and described, pages 44 to 48 of this catalogue.

Illustration Fig. 36 herewith shows Engine and Boiler turned over on side in position ready for moving. The mounted arrangement consists of two iron saddles or brackets with the steel axles made part of same, securely attached near mid length of Boiler. When at work the Engine is set upright on base, and the tongue and wheels removed, which is easily and readily done. In this manner we are prepared to furnish our 3, 5, or 7 H-P. Upright outfits; or the 3 or 5 H-P. Engine attached to the 7 H-P. Boiler; or the 5 or 7 H-P. Engine attached to the 10 H-P. Boiler; or the 3 H-P. Engine attached to the 5 H-P. Boiler. When furnished on wheels in this manner regular fixtures for complete outfit include the two steel wheels with saddle pieces and axles attached to Boiler, tongue and whiffletrees, in addition to the regular fixtures specified, page 50.

LEFFEL VERTICAL ENGINES WITH SUBMERGED TUBE BOILERS.—Specifications.

Size Number	Engine							Boiler									Approximate Shipping Weight	
	Horse Power of Engine	Cylinder		Usual Number of Rev. per Minute	Heavy Driving Pulley		Diameter Steam and Exhaust Pipes Inches	Horse Power of Boiler	Shell		Tubes—All 2 in. Diam		Fire Box		Diam. Base Inches	Dist'nce Bottom of Base to Top Smoke Cap Inches	Engine and Boiler on Base Pounds	Engine and Boiler on Wheels Pounds
		Diam. Inches	Stroke Inches		Diam. Inches	Face Inches			Diam. Inches	Length Inches	Number of	Length Inches	Diam Inches	Height Inches				
1	3	3½	6	240	21	6	¾ & 1¼	3	25	58	31	16	20	20	34	68	1500	2100
2	3	3½	6	240	21	6	¾ & 1¼	5	28	64	42	18	23	22	34	74	1800	2400
3	5	4½	7	240	21	6	¾ & 1¼	5	28	64	42	18	23	22	34	74	1900	2500
4	5	4½	7	240	21	6	¾ & 1¼	7	30	73	48	24	24	24	37	84	2100	2900
5	7	5	8	220	24	7	1 & 1½	7	30	73	48	24	24	24	37	84	2300	3100
6	7	5	8	220	24	7	1 & 1½	10	30	92	48	38	24	28	37	103	2600	3400

LEFFEL VERTICAL ENGINES WITH FULL LENGTH TUBE BOILERS.—Specifications.

Size Number	Engine							Boiler								Approximate Shipping Weight	
	Horse Power of Engine	Cylinder		Usual Number of Rev. per Minute	Heavy Driving Pulley		Diameter Steam and Exhaust Pipes Inches	Horse Power of Boiler	Shell		Tubes—All 2 in. Diam.		Fire Box		Diam. Base Inches	Engine and Boiler on Base Pounds	Engine and Boiler on Wheels Pounds
		Diam. Inches	Stroke Inches		Diam. Inches	Face Inches			Diam. Inches	Length Inches	Number of	Length Inches	Diam. Inches	Height Inches			
10	3	3½	6	240	21	6	¾ & 1¼	3	24	56	24	24	20	24	34	1700	2300
11	3	3½	6	240	21	6	¾ & 1¼	5	24	68	24	36	20	24	34	1900	2500
12	5	4½	7	240	21	6	¾ & 1¼	5	24	68	24	36	20	24	34	2000	2600
13	5	4½	7	240	21	6	¾ & 1¼	7	30	68	42	33	24	27	37	2300	3100
14	7	5	8	220	24	7	1 & 1½	7	30	68	42	33	24	27	37	2500	3300
15	7	5	8	220	24	7	1 & 1½	10	30	80	42	45	24	27	37	2700	3500

Regular Fixtures for any above Upright Engines and Boilers combined include Governor, Governor Belt, Driving Pulley (as per list), Throttle Valve, all necessary Oil Cups, Safety Valve, Steam Gage with Siphon, Glass Water Gage, Gage Cocks, Drip and Blow-Off Cocks, Fire Door and Frame, Ash Pit Door, Grate Bars, Base and Good Injector, with Piping and Valves, attached with Suction Hose.

Whistle, Smoke Stack, and Spark Arrester are not furnished unless specially ordered and charged for extra.

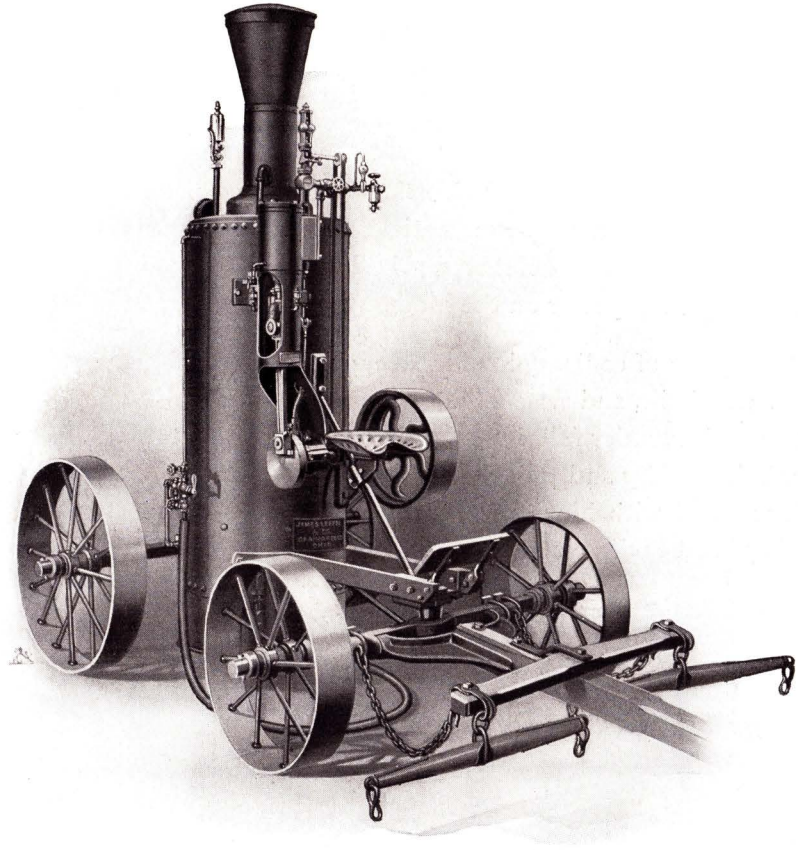
Leffel Portable Vertical Engines and Boilers Mounted on Four Wheels

FIGURES 39 and 40 on next two pages show two views of the Leffel Vertical Engines and Boilers mounted on four strong metal wheels with steel axles, affording a very substantial and convenient portable power admirably adapted for driving small threshers of all kinds, peanut cleaners, grinding mills, wood saws, ensilage cutters, corn shellers, and for the many other uses requiring power on the modern farm and plantation.

They are very simple and easily managed by anyone of ordinary intelligence, even though without previous experience in handling steam power; strong and well built, and not liable to break, or get out of order, or upset. Can be readily moved from one place to another under full steam pressure, and without removing fire, and without taking off any of the fittings; thus being easily and quickly set, as no foundation nor anchoring is necessary. Have tight ash-pan bottom, and are fitted with hinged ash-pit door provided with secure latch. Front wheels are 24 inches diameter, rear wheels 36 inches diameter, tires 4 inches wide by ½ inch thick.

These outfits are furnished in the various combinations of sizes given on page 54. Best prices with any additional information will be promptly furnished on application to nearest agency, or

The James Leffel & Co., Springfield, Ohio, U. S. A.



Leffel Portable Vertical Engine and Boiler — Front View

Fig. 39

These outfits are furnished with the Submerged Tube Cone Dome Vertical Boiler, also with the Full Length Tube Plain Vertical Boiler. Illustrations in Figs. 39 and 40 herewith were made from photographs of 5 H. P. Engine and 7 H. P. Submerged Tube Boiler.

In the Submerged Tube Boiler the upper tube-head and entire length of tubes are below the water line and submerged in water, greatly increasing their durability. By putting in an extra head at top and making dome cone-shaped, as we do in these Boilers, extra and abundant steam room is provided, insuring dry steam and better power.

In the Full Length Tube or Plain Vertical Boiler the upper tube head serves as top head for the Boiler, and said upper tube head and the upper ends of tubes are thus above the water line, rendering them more liable to burn out and leak.

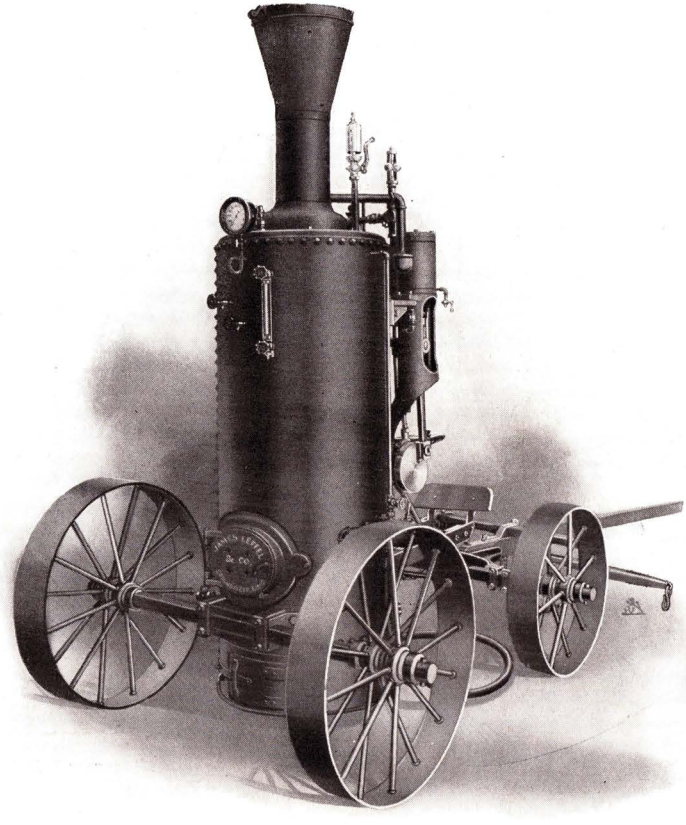
We consider the Submerged Tube Boiler as built by us the best Vertical Boiler on the market, and prefer to recommend and furnish that style. Although a little more costly in first place, it will prove more economical in end.

Leffel Portable Vertical Engine and Boiler—Rear View

Fig. 40

All these Boilers are built throughout of best grade Open Hearth Homogeneous Flange Steel Plate of 60,000 pounds tensile strength. The tubes are thoroughly well expanded into the heads, and ends are beaded over. A water space is provided around the sides of fire box. Convenient hand holes are provided in shell above lower tube head, and at bottom of water leg around fire box to facilitate cleaning out. The Boilers are built for 100 lbs. working pressure, but are tested under 150 lbs. hydrostatic pressure per square inch before shipment. In addition each outfit is run and tested under full steam pressure and load before shipment.

By reference to specifications on page 54 it will be seen these Engines and Boilers are of much more ample dimensions and consequently greater capacity than most other builders furnish.



Leffel Vertical Engines with Submerged Tube Boilers Mounted on Four Wheels

Size Number	Engine						Boiler							Approximate Shipping Weight Pounds	Cipher Code Word
	Horse Power of Engine	Cylinder		Usual Number of Revolutions per Minute	Heavy Driving Pulley		Horse Power of Boiler	Shell		Tubes—All 2 in. Diam.		Fire Box			
		Diam. Inches	Stroke Inches		Diam. Inches	Face Inches		Diam. Inches	Length Inches	Number of	Length Inches	Diam. Inches	Height Inches		
40	3	3½	6	240	21	6	3	25	58	31	16	20	20	3000	Uprar
41	3	3½	6	240	21	6	5	28	64	42	18	23	22	3400	Urban
42	5	4½	7	240	21	6	5	28	64	42	18	23	22	3500	Urchin
43	5	4½	7	240	21	6	7	30	73	48	24	24	24	4000	Urder
44	7	5	8	220	24	7	7	30	73	48	24	24	24	4200	Urfus
45	7	5	8	220	24	7	10	30	94	48	38	24	28	4500	Urghy

Leffel Vertical Engines with Full Length Tube Boilers Mounted on Four Wheels

Size Number	Engine						Boiler							Approximate Shipping Weight Pounds	Cipher Code Word
	Horse Power of Engine	Cylinder		Usual Number of Revolutions per Minute	Heavy Driving Pulley		Horse Power of Boiler	Shell		Tubes—All 2 in. Diam		Fire Box			
		Diam. Inches	Stroke Inches		Diam. Inches	Face Inches		Diam. Inches	Length Inches	Number of	Length Inches	Diam. Inches	Height Inches		
50	3	3½	6	240	21	6	3	24	56	24	24	20	24	3000	Rugat
51	3	3½	6	240	21	6	5	24	68	24	36	20	24	3400	Ruhlet
52	5	4½	7	240	21	6	5	24	68	24	36	20	24	3500	Rukon
53	5	4½	7	240	21	6	7	30	68	42	33	24	27	4000	Rulmin
54	7	5	8	220	24	7	7	30	68	42	33	24	27	4200	Rumy
55	7	5	8	220	24	7	10	30	80	42	45	24	27	4500	Rundab

Regular fixtures included at above prices comprise Governor, Governor Belt, Driving Pulley (as per list), Throttle Valve, all necessary Oil Cups, including Automatic Sight Feed Lubricator for Cylinder, Brass Pop Safety Valve, Steam Gage with Siphon and Cock, Glass Water Gage, Gage Cocks, Drip and Blow-Off Cocks, Fire Door and Frame, Hinged Ash Pit Door, Grate Bars, Tight Ash Pit Bottom bolted in place, good Injector with piping and Valves attached, with Suction Hose and Strainer, short Smoke Stack or Chimney with Spark Arrester, Tongue with Whiffletrees and Neck Chains, and Driver's Seat with Foot Rest.

Remarks

Prices with any additional information desired will be promptly furnished on application, and to prevent delay or misunderstanding when writing for prices, or ordering, please observe the following instructions:

FIRST. Always plainly state whether Engine and Boiler are both wanted.

SECOND. In addition to stating number, size and kind of outfit desired, also give figure number of illustration, and series letter of catalogue. This is catalogue "O."

THIRD. If regular Fittings and Fixtures complete are not wanted, please state fully and clearly just what trimmings are to be omitted, or what extras added, as otherwise we will understand regular trimmings are desired, and quote or furnish accordingly.

FOURTH. If Stationary Tubular Boiler is wanted, kindly state whether Half Arch Front or Full Flush Front Fixtures are desired.

FIFTH. If possible, also please give size, kind and capacity of driven machinery, also size and speed of belt-driven pulley on same, and whether or not belt will run direct from driving pulley on Engine to said driven pulley.

SIXTH. Circular Saw. If driven machine is circular saw mill, in addition to giving size and speed of belt pulley on mandrel, also give diameter of saw and number of teeth in same, and whether or not logs are pine or hard wood.

SEVENTH. Power Pump. If driven machine is centrifugal or other power pump, we should know total height to which water or other liquid is to be raised, also quantity — say number of gallons — to be handled in a given time — say per hour — and, if possible, the size of pump and diameter of suction and discharge pipes should also be given.

By thus being furnished with full and complete information, we are in position to submit definite proposition, and in addition, are often able to offer suggestions of considerable advantage and benefit to the customer.

THE JAMES LEFFEL & CO.,
Springfield, Ohio, U. S. A.

We Also Build

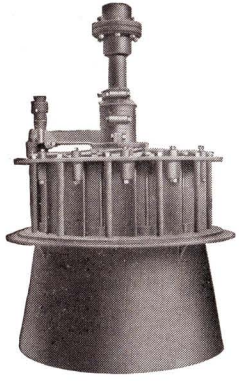


Fig. 37.

A complete line of TURBINE WATER WHEELS all SIZES and STYLES, on UPRIGHT or HORIZONTAL shafts, SINGLE or DOUBLE DISCHARGE. Our SAMSON and NIAGARA designs are built for LOW and HIGH HEADS and to suit all LOCATIONS and REQUIREMENTS

If you contemplate installing turbines write for our new catalog which contains a large number of illustrations of different styles of turbines, also tables of power and speed for same.

Our prices are very reasonable for strictly first class work.

Prompt and careful attention is given all communications.

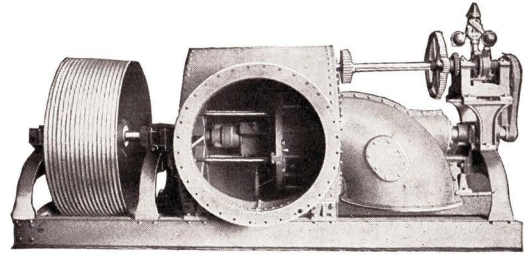


Fig. 38.

The James Leffel & Co.

Springfield, Ohio, U. S. A.

LEFFEL
THE JAMES LEFFEL & CO.
SPRINGFIELD, OHIO, U.S.A.
ENGINES